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THE HIGHWAY CONTRACTOR AND ROAD BUILDER

52
VOLUME ~~XIV~~
JULY—DECEMBER, 1917

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*Illustrated; (Ed.) Editorial; (n) Note.

GOOD ROADS

A Weekly Journal of Road and Street Engineering and Contracting

Old Series, Vol. LII.
New Series, Vol. XIV.

NEW YORK, JULY 7, 1917

Number 1

Costs of Applying Bituminous Surface Treatments to Water Bound Macadam in Philadelphia, Pennsylvania*

The practice of surface treating all water bound macadam roads with bituminous materials has received more general commendation by the public than any of the other innovations introduced by the bureau. This method of caring for the country roads unquestionably is the most economical manner in which water bound macadam roads may be maintained; and the continued smooth surface, together with a practical elimination of the dust nuisance, makes an ideal condition for streets of the residential and suburban districts.

Bituminous treatments were first started by the bureau in 1912, when only a few roads were in condition sufficiently good to warrant this treatment, but for the past three years the roads have been placed in such excellent condition that bituminous surface treatments have been applied to practically the entire yardage of macadam roads throughout the city. The dirt roads and, in a few cases, macadam not in first-class condition, are given a treatment of dust laying oil, which, while it has but slight influence on the durability of the road, does act effectively as a dust layer.

The first three years the bureau applied surface treatment showed a continuous decrease in unit costs, the cost per square yard in 1913 being 7.3 ct.; in 1914, 5.8 ct.; and in 1915, 5.03 ct.; the decrease in cost being due both to the decreasing amount of materials required per square yard for surface treatment and to the increased efficiency of the working forces and the more effective planning of the work.

The cost for 1916 amounted to 5.34 ct. per sq. yd., but this increase in cost was due largely to the increase in the cost of materials and the extraordinary labor conditions. The latter were not only responsible for our better men leaving the city employ for increased pay, but for the unfortunate so-called independent, lackadaisical attitude of the average laborer which has decreased his efficiency to a great extent.

The cost of the bituminous materials has increased on an average $.0021 per sq. yd.; and the covering material has increased an average of $.0001 per sq. yd., or a total of $.0022. If, for the purpose of comparison, the costs of materials be taken as they existed in 1915, it will be seen that under these conditions, the average treatment cost would show an

TYPICAL WATER BOUND MACADAM ROAD, SURFACE TREATED BY THE APPLICATION OF BITUMINOUS MATERIAL—PHILADELPHIA, PA.

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*From the annual report of the operations of the Bureau of Highways and Street Cleaning, Philadelphia, Pa. for 1916.

CHARACTER OF TREATMENT MATERIALS USED	TREATMENT	SQUARE YDS TREATED DURING 1916	AVERAGE MATERIALS PER SQ. YARD		AVERAGE LABOR COSTS PER SQ. YARD					AVERAGE MATERIAL COSTS PER SQ. YARD			AVERAGE TOTAL COST PER SQUARE YARD	AVERAGE TOTAL COST PER SQ. YARD FIRST AND RETREATMENTS			
			GALLONS BITUMINOUS MATERIAL	POUNDS OF COVERING MATERIAL	SWEEPING HAND	SWEEPING MACHINE	COVERING	CLEANING UP	TOTAL	BITUMINOUS MATERIAL	COVERING MATERIAL	TOTAL		1916	1915	1914	1913
REFINED COAL TAR — HOT APPLICATION — TARVIA A	1	39,212	.345	18.4	.0066	.0024	.0064	.0020	.0174	.0295	.0187	.0482	.0656	.0612	.0494	.0641	.0824
" " " " " "	2,etc	57,023	.294	16.4	.0058	.0013	.0075	.0022	.0168	.0246	.0168	.0414	.0582				
REFINED COAL TAR — COLD APPLICATION — TARVIA B	1	211,827	.428	17.4	.0063	.0016	.0063	.0018	.0160	.0299	.0180	.0479	.0639	.0485	.0506	.0566	.0658
" " " " " " "	2	465,273	.301	16.1	.0032	.0010	.0052	.0006	.0100	.0209	.0168	.0377	.0477				
" " " " " " "	3	254,799	.267	15.8	.0032	.0009	.0052	.0007	.0100	.0188	.0163	.0351	.0451				
" " " " " " "	4,etc	350,250	.240	15.8	.0030	.0008	.0051	.0006	.0095	.0168	.0164	.0332	.0427				
REFINED WATER-GAS TAR HOT APPLICATION — UGITE	1	39,128	.348	18.4	.0066	.0024	.0064	.0020	.0174	.0278	.0187	.0465	.0639	.0612	.0501	—	.0943
" " " " " " "	2	9,821	.319	15.9	.0026	.0007	.0050	.0004	.0087	.0256	.0164	.0420	.0507				
REFINED WATER-GAS TAR COLD APPLICATION — UGITE	1	75,088	.428	17.4	.0063	.0016	.0063	.0018	.0160	.0274	.0180	.0454	.0614	.0511	.0456	.0509	.0698
" " " " " " "	2	40,973	.299	15.4	.0024	.0004	.0053	.0004	.0085	.0193	.0160	.0353	.0438				
" " " " " " "	4	40,807	.315	16.2	.0011	.0002	.0022	.0006	.0041	.0201	.0168	.0369	.0410				
" " " " " " "	5	3,500	.200	16.0	—	.0002	.0031	—	.0033	.0128	.0165	.0293	.0326				
ASPHALT CUTBACK	1	79,617	.267	17.9	.0027	.0004	.0068	.0004	.0103	.0380	.0178	.0558	.0661	.0768	.0515	.0738	.0868
" "	2	100,300	.418	17.3	.0038	.0008	.0077	.0008	.0131	.0585	.0162	.0748	.0879				
" "	3	32,753	.362	18.0	.0026	.0008	.0045	.0013	.0092	.0471	.0181	.0652	.0744				
" "	4,etc	41,024	.320	17.9	.0033	.0008	.0046	.0003	.0090	.0451	.0181	.0632	.0722				
ASPHALT — 150° PENETRATION — 350° F	1	51,159	.270	17.5	.0037	.0006	.0091	.0002	.0136	.0223	.0178	.0401	.0537	.0497	.0461	—	—
" " " " "	2,etc	67,128	.262	17.7	.0032	.0009	.0064	.0003	.0108	.0208	.0150	.0358	.0466				
TOTALS (TARS AND ASPHALTS)		1,959,682	.310	16.6	.0038	.0010	.0057	.0009	.0114	.0250	.0170	.0420	.0534	.0534	.0503	.0584	.0730
ASPHALT ROAD [illegible] 1ST LAYER [illegible]		1,230,045	.246	—	—	—	—	—	—	.0151	—	.0151	.0151	.0151	.0111	.0141	—
GRAND TOTAL (SQ. YDS.)		3,189,727	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

[illegible]

LABOR AND MATERIAL	UNIT COSTS -1916-	-1915-	-1914-	-1913-
SCREENED GRAVEL PER 2000 #, DELIVERED ON THE ROAD	$2.10	$2.03	$2.14	$2.50
TRAP ROCK, PER 2000 #, DELIVERED ON THE ROAD	2.02	1.94	2.30	2.30
TARVIA A PER GALLON APPLIED	.085	.085	.085	.085
TARVIA B PER GALLON APPLIED	.07	.0692	.07	.07
UGITE HOT PER GALLON APPLIED	.08	.08	.09	.09
UGITE COLD PER GALLON APPLIED	.064	.06	.08	.08
ASPHALT CUTBACK PER GALLON APPLIED	.1403	.0791	.11⅓	.12
ASPHALT 150 PENETRATION PER GALLON APPLIED	.0795	.0791	—	—
ASPHALT ROAD OIL PER GALLON APPLIED	.0588	.0484	.0523	—
LABORERS PER 8 HOUR DAY	2.00	2.00	2.00	2.00
FOREMEN PER 8 HOUR DAY	4.00	4.00	4.00	4.00
ASST. FOREMAN PER 8 HOUR DAY	3.00	3.00	3.00	3.00
TEAMS, PER 8 HOUR DAY	4.80	4.48	4.75	5.20

AVERAGE LABOR COST, PER SQ. YD., FOR HAND & MACHINE SWEEPING, CHIPPING & CLEAN-UP DURING 1915	.0105
" " " " " " " " " " " " 1916	.0114
INCREASE	.0009

SUMMARY
MILES OF ROADWAY TREATED 1916 (18' WIDE)

REFINED COAL TAR — HOT APPLICATION — TARVIA A	9.12	Miles
" " " — COLD " TARVIA B	121.42	"
REFINED WATER-GAS TAR — HOT APPLICATION — UGITE	4.64	"
" " " " — COLD " — "	15.19	"
ASPHALT CUTBACK	24.01	"
ASPHALT, 150 PENETRATION, 350° F	11.20	"
TOTALS (TARS & ASPHALTS)	185.58	"
ASPHALT ROAD OIL	116.48	"
GRAND TOTALS	302.06	"

	SQ. YDS.	COST PER SQ. YD.
ROADS COVERED BY MEANS OF HORSE DRAWN SPREADERS	180,213	.00274
ROADS COVERED BY MEANS OF SHOVELS — HAND SPREADING	1,779,469	.00601
REDUCTION IN LABOR COSTS OF COVERING PER SQ. YARD, DUE TO SPREADER		.00327

ALL CLASSES MATERIALS 1916	TOTAL GALLONS APPLIED	910,056 GALS.
	TOTAL AMOUNT COVERING MATERIALS	16,245.4 TONS
	TOTAL COST	$100,896.01

TABLE SHOWING COSTS OF BITUMINOUS SURFACE TREATMENTS ON WATER BOUND MACADAM IN PHILADELPHIA, PA.

increase of $.0009 per sq. yd., attributable entirely to the prevailing labor conditions.

While this increase in cost is slight, it nevertheless must be considered that were it not for the labor condition there should have been a decided decrease in unit cost due to the smaller amount of material per square yard required each year, and on account of better planning and greater experience in handling the work.

During the year 1916, 185.58 mi. of country roads were given bituminous surface treatments, and 116.48 mi. were treated with dust-laying oil.

Requests for Road Improvement in Greenville County, South Carolina, have been made to the county commissioners by various delegations. The highways for which improvement is sought are: From Wares to Pelzer; Duncan Bridge Road; Fountain Inn to Fork Shoals; Tigerville to Sandy Flat; Gilreath's Mill to Ballenger's store; White Horse and Cedar Lane; Holliday Bridge Road.

Applying Bituminous Material. Spreading Covering Material.

METHOD OF BITUMINOUS SURFACE TREATMENT IN PHILADELPHIA.

Effect of Controllable Variables on the Toughness Test for Rock*

By F. H. JACKSON, Jr.†

This paper presents the results of a study of the standard toughness test for rock, which has recently been made in the laboratory of the U. S. Office of Public Roads and Rural Engineering. The test was introduced into the United States about 15 years ago by Logan Waller Page, who was at that time director of the road material laboratory of the Massachusetts Highway Commission. It was made a standard of this society in 1908 and has been in very general use in highway testing laboratories throughout the country since that time. The general principles involved are given in the standard.[1]

A detailed description of the method employed in the government laboratory has likewise been published;[2] hence, a description of the test will not be given here. In general, it has been considered very satisfactory for the purpose for which it was designed, that is, to measure the relative resistance to impact of road building rock. Certain discrepancies have been noted recently, however, between tests made in the same laboratory on samples from different portions of a rock quarry, as well as between tests made by different laboratories on apparently identical material. These discrepancies would seem to indicate that the variations in the physical properties of rock from the same quarry may be much greater than has been heretofore considered probable, and also that the method of conducting the test is perhaps not sufficiently controlled under the present standard to insure check results in all cases. In order to obtain some quantitative preliminary data regarding the second point, a cooperative set of tests was recently made by five road material testing laboratories. The toughness of the same apparently homogeneous sample of trap rock was obtained independently by each laboratory, four determinations of the toughness being made in every case but one. The results obtained are shown in Table I.

TABLE 1—RESULTS OF COOPERTIVE TOUGHNESS TESTS.

Name of Laboratory	Toughness; Height of Fall Causing Failure, cm. Test No. 1	2	3	4	Average
New York State........	19	20	16	16	18
Pennsylvania State	27	29	28	33	29
Ohio State	18	19	..	..	19
Purdue University	29	34	31	25	30
Office of Public Roads..	14	17	16	15	16

The large variations shown demonstrate the need of an investigation of the possible cause of the discrepancies with the view of obtaining data to be used as the basis for the formulation of a revised standard.

An analysis of the methods now used in making the toughness test shows that discrepancies in results may in general be traced to either (1) the fact that the range in physical properties of the quarry product is so great that it is impossible to obtain an average value for the toughness of the material with the small size and number of test specimens used in a given determination, or (2) to the fact that certain variables may be introduced during the preparation or testing of the specimen which might affect the result and which are not controlled by the present standard. These considerations are of course entirely distinct from any question of the value of a test for impact, as an indication of the suitability of rock for road building purposes.

A comprehensive consideration of the variables affecting the accuracy of the test must include a study of the following:

Variations in Toughness of Rock from Same Quarry

A determination of the probable extent of this variation is very important for obvious reasons. For instance, there is a general impression current among those interested commercially in the production of stone for road work, that the results of a single test, made perhaps several years before, are sufficient from which to judge the quality of a rock quarry. Likewise, in sampling rock for test, it is usually thought sufficient to take a single sample without any particular care being exercised to insure having it represent the only kind of material which it is proposed to use. The results of a few tests of samples from a number of well known quarries, which have been in operation for some years, are given in Table II, and show the wide range in toughness which it is possible to obtain on material from the same quarry. Although all of these tests were made in a single laboratory, using the same testing machine and tested in most cases by the same operators, and were therefore presumably made under fairly uniform conditions, it is quite possible that some of the variations indicated are due to a failure to appreciate, and therefore control, variables introduced during either the preparation or testing of the specimens. In order to throw some light on this point, the actual variations in the quality of the product of several quarries were studied under as nearly as possible identical conditions.

TABLE II—VARIATION OF TOUGHNESS OF ROCK FROM SAME QUARRY.

(Samples Taken at Different Times).

Location of Quarry	Kind of Rock	Toughness; Height of Fall Causing Failure, cm. Test No. 1	2	3	4	5	6
New York	Trap	27	27	17	33	21	23
New Jersey	Trap	27	33	30	..	..	..
Pennsylvania	Trap	12	26	17	13	..	..
Ohio	Limestone .	18	9	6	7	..	..
Ohio	Limestone .	16	11	10	..	..	..
New York	Limestone .	9	7	13	13	..	..
Maryland	Schist	20	19	34	30	44	..
North Carolina...	Granite ...	13	14	9	10	10	11
New Hampshire.	Granite ...	7	9	8	8	..	..

Table III gives results showing the possible variation in toughness of several typical rock quarries when the samples are taken at the same time from different portions of the deposit. These results are of principal interest in showing the wide range in toughness possible to obtain on samples taken from different portions of the same quarry, even when the material quarried is considered to be very uniform in quality, which is the case in both the trap rock and granite quarries examined. In the case of two of the trap rock quarries, there was also noted a considerable variation in the toughness of the individual specimens composing a sample. The individual breaks are given in Table IV in connection with the study of the effect of direction of drilling on toughness.

It was noted at the time the trap rock specimens were broken, that the ones showing the most irregular fracture at failure were in general the ones showing the lowest results, even when there was absolutely no visible line of weakness before failure. The appearance of these peculiar fractures, which every experienced operator has noticed, would seem to indicate that there may be present in some rocks a great number of minute planes of weakness, running in all directions and formed possibly at the same time and in much the same way as the large joint planes with which the quarryman is familiar. The variable toughness shown by different specimens cut from the same piece might also be caused by the formation of incipient fractures in the mass due to blasting. Conditions such as these are emphasized by the comparatively small size test specimens and might form an argument for the adoption of a larger size. When we consider, however, the increased cost of and the time necessary to prepare larger specimens, it would appear advisable to use the present size, and to obtain an average value for the toughness by making a larger number of tests than is at present customary.

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*Paper presented at the 20th annual meeting of the American Society for Testing Materials, Atlantic City, N. J., June 26-29, 1917.

†Assistant Testing Engineer, Office of Public Roads and Rural Engineering, U. S. Department of Agriculture.

[1] Standard Test for Toughness of Macadam Rock (Serial Designation: D 3-08), 1916 Book of A.S.T.M. Standards, p. 526.

[2] Bulletin No. 347, U. S. Department of Agriculture.

TABLE III—VARIATION IN TOUGHNESS OF ROCK FROM SAME QUARRY.
(Samples Taken at Same Time).

Location of Quarry	Kind of Rock	Average Toughness; Height of Fall Causing Failure cm. Specimen No. 1	2	3	4	5	6	General Av'age	Maximum Variat'n
New York	Trap	20[1]	20[2]	15[2]	22[3]	..	..	19	7
New Jersey	Trap	29[2]	33[4]	35[2]	..	..	..	32	[illegible]
Maryland	Trap	20[5]	10[5]	20[5]	..	..	..	20	1
Maine	Granite	18[6]	16[6]	16[6]	..	..	..	17	2
Massachusetts	Granite	9[6]	10[6]	10[6]	..	..	..	10	1
Maryland	Granite	10[7]	10[8]	10[7]	..	..	..	10	0
Ohio	Limestone	12	7	8	14	16	12	12	[illegible]
Ohio	Limestone	6	8	7	6	6	5	6	3
Ohio	Limestone	12	8	[illegible]	9	11	10	9	[illegible]

[1] Average of 12 specimens.
[2] Average of 10 specimens.
[3] Average of 11 specimens.
[4] Average of 8 specimens.
[5] Average of 5 specimens.
[6] Average of 2 specimens.
[7] Average of 3 specimens.
[8] Average of 4 specimens.

In the case of the granites examined, much greater uniformity was observed, not only between different samples from the same quarry but also between individual specimens taken from the same sample. The limestones tested represent probably the extreme of non-homogeneity apt to be found in ordinary road building rock and are given for this reason. Each of these materials was extremely non-homogeneous in appearance, individual pieces running from fairly tough, fine grained rock to portions showing a high percentage of argillaceous material, which runs of course much lower in toughness. It is obvious that the only way to obtain average values for the toughness of material from deposits such as these, is to exercise extreme care in selecting samples to insure that all variations in quality are represented. This would, of course, entail more work than the mere picking of a single sample, which is common practice.

TABLE IV—EFFECT OF DIRECTION OF DRILLING SPECIMEN ON TOUGHNESS.

Location of Quarry.	Kind of Rock.	Sample Set.	Toughness; Height of Fall Causing Failure, cm. Specimen No. 1	2	3	4	5	6	Average
Pennsylvania	Granite	A	9	8	9	11	9	8	9
		B	9	11	10	10	11	10	10
Pennsylvania	Granite	A	8	6	6	7	7	6	7
		B	7	5	6	7	6	[illegible]	7
Maine	Granite	A	7	9	8	8	9	8	8
		B	10	9	8	9	7	..	9
Virginia	Granite	A	8	7	5	4	6	6	6
		B	6	6	7	6	6	6	6
Massachusetts	Granite	A	10	7	9	8	10	8	9
		B	8	8	10	9	11	11	10
Maine	Granite	A	10	11	10	12	11	12	11
		B	10	10	12	10	10	11	11
North Carolina	Granite	A	8	9	7	6	6	7	7
		B	5	5	7	6	6	[illegible]	6
Maine	Granite	A	7	7	7	6	6	..	7
		B	9	8	9	7	6	7	8
New York	Gneiss	A	13	12	12	12	16	11	13
		B	6	7	6	6	6	7	6
Maryland	Schist	A	32	30	30	..	..	..	30
		B	16	12	9	..	..	..	12
New York	Limestone	A	13	14	13	..	..	..	13
		B	12	10	12	..	..	..	12
Indiana	Limestone	A	11	12	10	10	..	...	11
		B	9	10	12	10	..	..	10
West Virginia	Sandstone	A	11	13	10	13	9	13	12
		B	9	8	8	9	7	6	8
....	Sandstone	A	11	12	11	9	11	11	11
		B	11	10	11	11	10	10	11
Virginia	Sandstone	A	10	10	10	9	10	..	10
		B	7	7	7	7	..	..	7
New York	Trap	A	21	17	21	17	19	19	19
		B	21	19	25	23	19	20	21
New York	Trap	A	22	19	20	20	22	..	21
		B	19	19	26	16	20	..	20
New Jersey	Trap	A	27	27	28	30	38	..	30
		B	24	29	25	30	27	..	27
New Jersey	Trap	A	32	33	32	39	33	35	34
		B	34	33	36	38	..	..	[illegible]

A—Specimen drilled perpendicular to the direction of laying the street.
B—Specimen drilled in the direction of laying in the street.

An interesting feature in connection with the limestone tests is the fact that considerable variation was also noted in even the standard abrasion test, which utilizes a very much larger sample. In the first case two abrasion tests gave French coefficients of wear of 13.3 and 10.5; in the second case, 12.1 and 10.3; and in the third case, 18.2 and 10.5.

The results given in Table III are presented for the purpose of showing quantitatively the possible bearing on the test result of lack of care in sampling. Unless there is reasonable assurance that the material tested is representative, no amount of care in the preparation and testing of the individual samples can be expected to secure reliable results.

Variables Introduced During the Preparation of the Test Specimen

Variables occurring during preparation of the test specimen may include (1) effect of direction of drilling specimens with reference to any possible plane of structural weakness, such as rift, bedding plane, or plane of foliation; (2) effect of size of test specimen, either in diameter or height; (3) effect of moisture content; and (4) effect of lack of care in preparation of specimen, such as failure to have perfectly plane bearing surfaces, or ends absolutely perpendicular to the axis of the cylinder.

With reference to the first point it has been the custom in most laboratories to drill specimens from a rock sample at random, except in cases where well developed, visible planes of foliation appear, in which case specimens are usually taken perpendicular to the foliation. The question has been recently raised, however, whether other materials might not possibly have planes of weakness, which would cause specimens drilled in one direction to fail sooner than those drilled in the other direction. Thus, granites drilled along the rift, and sedimentary rocks, such as limestone and sandstone drilled along the bedding plane, might show lower toughness values than when drilled in other directions. The results of the author's study along this line are given in Table IV.

The eight granites examined represented material from some of the best known granite quarries in the United States. In each case, results recorded under sample set A were obtained on material drilled perpendicular to set B. The samples were full-size paving blocks, and the individual specimens were drilled along the two short dimensions, sample set B being drilled in the direction of laying in the street. It is seen at once that there is very little difference in the average toughness of sets A and B. In fact the difference is so slight as to be practically negligible.

When we come to the foliated types, however, as represented by the gneisses and schists, we find as would be expected, a large difference in toughness, the specimens drilled perpendicular to the foliations being in one case twice, and in the other case almost three times as tough as those drilled parallel to them.

In regard to the sedimentary rocks, only slight variations are noted, with two exceptions, namely, the first and third sandstones tabulated. Both of these materials showed thin, well-developed planes of bedding. In the case of the other sandstone, as well as both of the limestones, the stratification was not nearly so well marked. These results indicate that in certain cases at least, the bedding plane of sedimentary rocks must be considered in preparing specimens for test. In the case of both the sedimentary and foliated types, the specimens of set A were drilled perpendicular, and the specimens of set B parallel, to the plane of weakness.

The results on four samples of trap rock are also given, and indicate very little difference in toughness due to the direction of drilling. The two sets of specimens in these cases were drilled perpendicular to each other, without any reference to the natural bed of the stone, since true bedding, so-called, does not exist in the massive trap rock formations. The individual results of breaks given in Table IV indicate the possible variation in toughness of different specimens taken from the same piece and tested under identical conditions. This latter point has been discussed under the head of variations in quarry samples.

The reason for the large number of tests of granite compared to the other types is because of the possible desirability of using this test in connection with the use of granite in stone block construction. As may be seen, there is not only considerable range in toughness of the different granites tested, but the individual specimens in every case lie very close to the average, which indicates that it should not be a difficult matter to obtain check results.

Variation in both the diameter and height of a test specimen should at first sight be easily controlled during its preparation. Experience has shown, however, that it is practically impossible to manufacture diamond drills which will drill cores of constant diameter, the wearing away of the diamonds resulting in producing cylinders of gradually increasing diameter. This condition naturally results in tests being made on specimens covering a considerable range in diameter with consequent possible variation in result. In Table V are given the results of a study of the effect of this variable, made with the view of determining how great a permissible variation in diameter should be allowed.

TABLE V—EFFECT OF DIAMETER OF SPECIMEN ON TOUGHNESS.

Location of Quarry.	Kind of Rock.	Diameter, mm.	Toughness; Height of Fall Causing Failure, cm. Specimen No. 1	2	3	4	5	6	Average.
Ohio	Limestone	18.0	2	3	2	[illegible]	3	3	[illegible]
Ohio	Limestone	23.5	2	3	3	[illegible]	..	..	3
Ohio	Limestone	24.5	3	3	3	3	..	..	3
Ohio	Limestone	25.0	3	2	3	3	..	..	3
	Sandstone	18.5	8	[illegible]	7	7	[illegible]	7	7
	Sandstone	23.0	9	9	8	[illegible]	[illegible]	[illegible]	8
	Sandstone	24.0	11	10	11	11	10	10	11
	Sandstone	25.0	13	13	11	11	12	13	12
Maryland	Granite	19.0	[illegible]	7	[illegible]	[illegible]	[illegible]	7	6
Maryland	Granite	24.0	11	10	10	11	10	10	10
Maryland	Granite	25.0	12	12	11	12	13	15	13
Maryland	Trap	19.0	16	16	15	14	15	..	15
Maryland	Trap	23.0	19	19	19	20	..	..	19
Maryland	Trap	24.0	20	18	21	21	..	..	20
Maryland	Trap	25.0	23	22	22	22	24	21	22
Maryland	Trap	26.0	25	27	27	26	..	..	26
	Granite	23.0	8	8	7	6	8	..	8
	Granite	24.0	10	10	9	9	10	..	10
	Granite	25.0	11	11	11	10	..	..	11

Five materials showing different degrees of toughness were examined and in all cases but one marked variations were observed. For instance, in the case of the trap rock an increase of 3 mm. in diameter resulted in an increase in toughness of 36%. In the case of the sandstone, a difference of 2 mm. in diameter resulted in a 50% increase in toughness. These variations would go far towards explaining the discrepancies noted in Table I, even assuming all other variables to be of negligible importance, and certainly shows the necessity of maintaining the diameter of the specimen at as near 25 mm. as possible. The experience of the author covering a period of several years in the government laboratory would indicate that a permissible variation of less than 1 mm. would not be practical from the standpoint of drill manufacture. No greater latitude should be allowed, however, under any circumstances.

The matter of height of specimen is, of course, not difficult to control, since it is a comparatively simple matter to prepare cylinders almost exactly 25 mm. long. A few comparative tests were made, however, which indicated that a range of as much as 1 mm. might be allowed without affecting the result.

TABLE VI.—EFFECT OF MOISTURE CONTENT OF SPECIMEN ON TOUGHNESS.

Kind of Rock.	Condition of Specimen.	Toughness; Height of Fall Causing Failure, cm. Specimen No. 1	2	3	4	Average.
Sandstone	Dry	11	10	11	11	11
	Saturated	11	[illegible]	9	10	10
Granite	Dry	12	12	11	13	12
	Saturated	8	12	10	10	10
Trap	Dry	19	19	19	19	19
	Saturated	18	19	18	20	19
Dolomite	Dry	10	12	14	..	12
	Saturated	10	[illegible]	10	..	10
Limestone	Dry	9	9	..	..	9
	Saturated	9	[illegible]	..	..	9
Quartzite	Dry	21	17	19	..	19
	Saturated	18	18	16	..	18

The question of the moisture content of specimens at time of testing and its possible effect on toughness was also considered. The results of the tests are given in Table VI. As may be seen, a slightly lower toughness appears in some

(*Continued on page 8*)

Report of the Road Materials Committee of the American Society for Testing Materials

The report of Committee D-4, on Road Materials, presented at the twentieth annual meeting of the American Society for Testing Materials last week, included a number of proposed tentative tests and four new definitions.

The first tentative test proposed was one for the toughness of rock. According to the report, over nine years' experience in routine testing laboratories and a considerable amount of investigation resulted in the conclusion that it was desirable to revise the existing standard test for toughness of macadam rock as printed in the 1916 Book of A. S. T. M. Standards, "giving more complete and specific directions in connection therewith, and at the same time making the test more serviceable for ascertaining the relative toughness of different rocks." The following test was recommended by the committee for publication as tentative for one year before referring it to a letter ballot of the society for adoption as a standard:

1. Definition.—Toughness as applied to rock, is the resistance offered to fracture under impact, expressed as the final height of blow required of a standard hammer to cause fracture of a cylindrical test specimen of given dimensions.

2. Sampling.—Quarry samples of rock from which test specimens are to be prepared shall measure at least 6 ins. on a side and at least 4 ins. in thickness, and when possible shall have the plane of structural weakness of the rock plainly marked thereon. Samples should be taken from freshly quarried material, and only from pieces which show no evidences of incipient fracture due to blasting or other causes. The samples should preferably be split from large pieces by the use of plugs and feathers and not by sledging. Commercial stone block samples from which test specimens are to be prepared shall measure at least 3 ins. on each edge.

3. Size and Form of Test Specimen.—Specimens for test shall be cylinders prepared as described in Section 4, 25 mm. in height and from 24 to 25 mm. in diameter. Three test specimens shall constitute a test set. The ends of the specimens shall be plane surfaces at right angles to the axis of the cylinder.

4. Preparation of Test Specimens.—One set of specimens shall be drilled perpendicular and another parallel to the plane of structural weakness of the rock, if such plane is apparent. If a plane of structural weakness is not apparent, one set of specimens shall be drilled at random. Specimens shall be drilled in a manner which will not subject the material to undue stresses and which will insure the specified dimensions. The ends of the cylinders may be sawed by means of a band or diamond saw, or in any other way which will not induce incipient fracture, but shall not be chipped or broken off with a hammer. After sawing, the ends of the specimens shall be ground plane with corborundum or emery on a cast iron lap until the cylinders are 24 mm. in length.

5. Impact Machine.—Any form of impact machine which will comply with the following essentials may be used in making the test:

(a) A cast iron anvil weighing not less than 50 kg., firmly fixed upon a solid foundation;

(b) A hammer weighing 2 kg., arranged so as to fall freely between suitable guides;

(c) A plunger made of hardened steel and weighing 1 kg., arranged to slide freely in a vertical direction in a sleeve, the lower end of the plunger being spherical in shape with a radius of 1 cm.;

(d) Means for raising the hammer and for dropping it upon the plunger from any specified height from 1 to not less than 75 cm., and means for determining the height of fall to approximately one millimeter;

(e) Means for holding the cylindrical test specimen securely on the anvil without rigid lateral support, and under the plunger in such a way that the center of its upper surface shall, throughout the test, be tangent to the spherical end of the plunger at its lowest point.

6 Method of Testing.—The test shall consist of a 1-cm. fall of the hammer for the first blow, a 2-cm. fall for the second blow, and an increase of 1-cm. fall for each succeeding blow until failure of the test specimen occurs.

7. Recording and Reporting Results.—The height of the blow in centimeters at failure shall be the toughness of the test specimen. The individual and the average toughness of three test specimens shall be reported when no plane of structural weakness is apparent. In cases where a plane of structural weakness is apparent the individual and average toughness of the three specimens in each set shall be reported and identified. Any peculiar condition of a test specimen which might affect the result, such as the presence of seams, fissures, etc., shall be noted and recorded with the test result.

A revision of the tentative test for the determination of the apparent specific gravity of coarse aggregates was also proposed by the committee. In its report last year the committee proposed a tentative test which was published among the tentative standards. While, according to the report, it is believed that this test is satisfactory for aggregates that are absolutely homogeneous, recent investigations have demonstrated that it is difficult to ascertain the homogeneity of an aggregate. The tentative test proposed by the committee to supersede the one presented in 1916 follows:

The apparent specific gravity shall be determined in the following manner:

1. The sample, weighing 1000 g. and composed of pieces approximately cubical or spherical in shape and retained on a screen having 1.27-cm. (½-in.) circular openings, shall be dried to constant weight at a temperature between 100 and 110° C. (212 and 230° F.), cooled, and weighed to the nearest 0.5 g. Record this weight as weight A. In the case of homogeneous material, the smallest particles in the sample may be retained on a screen having 1¼-in. circular openings.

2. Immerse the sample in water for 24 hours, surface-dry individual pieces with aid of a towel or blotting paper, and weigh. Record this weight as weight B.

3. Place the sample in a wire basket of approximately ¼-in. mesh, and about 12.7 cm. (5 in.) square and 10.3 cm. (4 in.) deep, suspend in water[1] from center of scale pan and weigh. Record the difference between this weight and the weight of the empty basket suspended in water as weight C. (Weight of saturated sample immersed in water.)

4. The apparent specific gravity shall be calculated by dividing the weight of the dry sample (A) by the difference between the weights of the saturated sample in the air (B) and in water (C), as follows:

$$\text{Apparent Specific Gravity} = \frac{A}{B\text{-}C}$$

5. Attention is called to the distinction between apparent specific gravity and true specific gravity. Apparent specific gravity includes the voids in the specimen and is therefore always less than or equal to, but never greater than the true specific gravity of the material.

This test, according to the report, is suitable for both nonhomogeneous and homogeneous coarse aggregate and, like the test for toughness of rock, was recommended by the committee for publication for one year as tentative before being put to letter ballot for adoption as standard.

The recommendations of the committee for the revision of the standard method for the distillation of bituminous materials for road treatment dealt only with the specifications for the thermometer used. It was explained in the report that the method adopted by the society in 1916 was entirely satisfactory from the standpoint of Committee D-4 alone, but that the paragraphs specifying the thermometer to be used should be revised to conform with similar portions of other specifications.

During the past year, according to the report, a joint conference committee, made up of members of Committees C-9, On Concrete and Concrete Aggregates, and D-4, has given further consideration to the terms "aggregate," "bank gravel,"

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[1] The basket may be conveniently suspended by means of a fine wire hung from a hook shaped in the form of a question mark with the top end resting on the center of the scale pan.

GOOD ROADS

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

JULY 7, 1917

BITUMINOUS SURFACE TREATMENTS

The application of bituminous surface treatments to water bound macadam roads is now standard practice and probably needs no advocacy among road builders. At the same time there are many miles of macadam and gravel road that could be maintained in better condition and at considerably reduced cost if such treatments were regularly and properly applied.

According to the 1916 report of former Chief Connell of the Philadelphia Bureau of Highways and Street Cleaning, the practice of applying bituminous surface treatments to the water bound macadam roads of Philadelphia "has received more general commendation by the public than any of the other innovations introduced by the bureau." The method, Mr. Connell's report states, "unquestionably is the most economical manner in which water bound macadam roads may be maintained," while the resulting surface and the practical elimination of dust make bituminous surface treatment the ideal plan of caring for water bound macadam in residential and suburban districts.

What has been accomplished in Philadelphia can be done in most other cities and in many towns and counties. There is little reason, now, for dusty main roads. The expense need not deter many communities from undertaking the work, for, as may be seen by reference to the extract from the Philadelphia report on other pages of this issue, the cost is small. In 1913 it cost Philadelphia 7.3 ct. per sq. yd. This cost was reduced to 5.8 ct. in 1914 and to 5.03 ct. in 1915, while in 1916 there was a slight increase, due, as pointed out in the report, to increases in the costs of labor and materials. Last year's cost of 5.34 ct. per sq. yd. was not excessive, however.

In the Philadelphia work Mr. Connell had the advantage of efficient labor that had been trained in the work to be done and also was able to buy materials in larger quantities than could be used by smaller cities. But even at a cost of 6 ct. per sq. yd. the cost of treating an 18-ft. road would be only a little more than $625 a mile—certainly not too large an amount to be spent for eliminating dust, securing a smooth, hard surface and preserving the roadway. Figures on the last named are not at hand, but it is safe to assume that a very considerable part of the outlay for surface treatment would be saved in lessened maintenance costs.

TESTING ROCK SAMPLES

The necessity for testing a sufficient number of samples to get results of real value was one of the important points of practical value to road builders brought out at the convention of the American Society for Testing Materials at Atlantic City last week. The matter was brought up in the discussion of the paper on "Effect of Controllable Variables on the Toughness Test for Rock," and was emphasized by two speakers, Logan Waller Page, Director of the Office of Public Roads and Rural Engineering, and L. Reinecke of the Geological Survey of the Ontario Department of Mines.

As pointed out by the speakers, it is necessary to have a considerable number of samples from different parts of a quarry and also to have tests made at not too great intervals of time if it is hoped to get average results that are really indicative of the character of the rock. Citing the average trap rock quarry as an illustration, Mr. Page pointed out that most rock of this kind is found in dikes and that because of the manner of their formation these dikes vary in the character of the rock in different parts. Obviously, the results of a test on a sample taken near the edge of the dike would not necessarily serve as an indication of the character of the rock near the center, and to get an average value representative of the run of the quarry it would be necessary to use the average result of tests on a number of samples taken from different parts. Mr. Page recommended eight or ten samples.

Mr. Reinecke agreed that a large number of samples should be tested, saying that probably not in 5% of quarries would samples from different parts of a 30-ft. face give uniform results within a value of 2 in the toughness test. In the remainder of the quarries, he held, the value would vary by perhaps 7 or 8.

The variations in results obtained in the toughness test for rock as indicated in the paper to which reference has been made would tend to emphasize an especial need for numerous samples for that particular test, but the principle is of much wider application. Road building is a comparatively young art in many of its branches, and the lack of complete standardization in some of its processes calls for the utilization of every possible safeguard against incorrect conclusions. It is easy to make the mistake of generalizing from data that are not general or of attempting to evolve methods from experimental work carried out under conditions not fully known.

BOND ISSUES FOR MILITARY ROADS

So much has been written on the economics of bond issues for road building that there is little new to be said on the subject. There is, however, one phase of the matter worth note, and that is the use of bonds for meeting the cost of military roads.

The general proposition that it is bad business to issue bonds for temporary work must stand. There is ordinarily no justification for the issuance of, say 50-year bonds, to lay a wearing surface that will last only 10 or 15 years. In the case of a purely military road—that is, a road built solely or principally for military purposes, this does not hold true. Wars are generally fought as much, if not more, for posterity than for the generation that wages them; this war is certainly of that kind. That being so, it is right that posterity should bear at least part of the cost. And only part of the cost can fall upon the generations to come even if the entire expense of construction is met by bonds, for perhaps 50% of the work will be permanent and it would be difficult if not almost impossible to build a road that would be of no commercial use after the war.

Effect of Controllable Variables on the Toughness Test for Rock

(Continued from page 5.)

cases to result from saturating the specimens prior to testing. The differences are so slight, however, that they may be accidental. In any event they are not great enough to be of practical importance in routine testing.

One other point in connection with the preparation of the specimen remains to be mentioned, and this is the effect of lack of care in the preparation of the faces of the cylinder, resulting in uneven bearing and eccentric loading. The effects of either of these conditions are so obvious, that only enough data will be presented to give some idea quantitatively of the enormous error introduced by careless preparation of the test specimen. For instance, a sample of granite with a normal toughness of 12, showed an average toughness of only 7 when tested under only slightly imperfect bearing conditions, and an average toughness of 8 when subjected to eccentric loading—that is, when the axis of the specimen was not exactly vertical, thereby throwing the tangent point of the plunger slightly to one side. It seems almost unnecessary to emphasize these points, but experience has shown that operators, unless carefully supervised, are apt to slight the final preparation of a test specimen, under the impression that it makes very little difference in the result.

Variables Introduced During the Test

Variables occuring during testing should include (1) such variations in the design of the testing machine as might affect the test, such as different devices for holding the specimen in place; (2) the degree of freedom with which the plunger is allowed to slide vertically; and (3) the effect of secondary blows produced by the rebound of the hammer. It is regretted that lack of time has prevented any study of the first of these points, because it is quite possible that large discrepancies might result from the use of different types of grips, on account of variations in the amount of lateral pressure brought to bear on the specimen during the test. In all of the tests made in connection with this investigation, the form originally devised by Mr. Page,[1] and which has proved very satisfactory, was used.

In regard to the second point, the present standard test specifies that the plunger shall be held in place over the specimen by means of springs. As a matter of fact, springs were never used except at first, the plunger resting upon the test specimen and being capable of free vertical movement in a sleeve. This results in considerable vibration in the plunger after each blow of the hammer, which is especially noticeable when tough materials are being tested. A few tests were made to determine the effect of this vibration on the toughness, the idea being that the amount of vibration with consequent local damage to the specimen might vary with different testing machines. Samples of the traps and granites used in this study were tested by holding the plunger rigidly in position over the test specimen until failure occurred, thereby eliminating all vibration. In no case was the difference in toughness, as compared to the normal result, great enough to be of practical moment, indicating thereby that the vibration of the plunger does not actually weaken the resistance to impact of the specimen. This point is of interest because the test has been criticised in this connection.

The only other point remaining to be discussed is the effect on the test result of the secondary blow produced by the rebound of the hammer. The secondary blow varies in intensity with the toughness of the material, reaching as high as 25 or 30% of the total fall of the hammer with very tough materials. To determine the effect of this action on fairly tough materials, specimens taken from a sample of trap rock showing a normal toughness of 29, were subjected to repeated impact from a height of 20 cm. until failure occurred. In one case 27, in another case 36, and in still another case 41 blows of the hammer from this height were required to break the specimen, indicating clearly that the secondary blow of the hammer can have no practical effect in weakening the specimen. These results are interesting from a practical standpoint in indicating that no changes in the actual conduct of the test are necessary to produce accurate results. In fact, the actual testing of the specimen is the simplest part of all, the real difficulty in obtaining reliable results lying, as has been stated, in the sampling of the material and the preparation of the specimen.

Conclusions

The following points in connection with the work described may be noted:

1. In judging the quality of a rock quarry from the results of a single test, the fact that large variations in toughness may occur from time to time should be borne in mind, and an effort made to secure a test of the material at approximately the same time that the material is to be used.

2. Great care should always be exercised in selecting samples for the toughness test, because the product of a rock quarry of even apparently uniform quality is apt to vary throughout different portions of the face.

3. In preparing samples for the toughness test, the following points should be kept in mind and the operator governed accordingly:

(a) In every case where planes of foliation as in all gneisses and schists, or planes of bedding as in many sandstones and some limestones, are visible, specimens should be drilled as nearly at right angles to the plane of weakness as possible. Another set of specimens should also be prepared from samples drilled paralled to the plane of weakness;

(b) No core drill should be used which drills specimens with a greater total variation than 1 mm.;

(c) Variations in the height of specimens may be as great as 1 mm. without practically affecting the result;

(d) Variations in the moisture content of specimens apparently do not practically affect the result. For the sake of uniformity, however, all specimens should be dried in an oven prior to testing; and

(e) The greatest possible care should be exercised in the preparation of the specimen, so as to insure perfect bearing surfaces absolutely perpendicular to the axis of the cylinder.

4. Very little injury is done to a specimen during the progress of the test as a result of vibrations of the plunger.

5. The total energy of the blow required to cause failure is not influenced by secondary blows of the hammer, produced by its rebound after striking the plunger.

Report of the Road Materials Committee of the American Society for Testing Materials

(Continued from page 6.)

"screen," and "sieve." As a result of that study the committee recommended for publication as tentative the following definitions:

Aggregate.—The inert material, such as sand, gravel, shell, slag or broken stone or combinations thereof, with which the cementing material is mixed to form a mortar or concrete.

Screen.—In laboratory work an apparatus, in which the apertures are circular, for separating sizes of material.

Sieve.—In laboratory work an apparatus, in which the apertures are square, for separating sizes of material.

Bank Gravel.—Gravel found in natural deposits, usually more or less intermixed with fine material, such as sand or clay, or combinations thereof; gravelly clay, gravelly sand, clayey gravel and sandy gravel, indicate the varying proportions of the materials in the mixture.

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[1] Bulletin No. 347, U. S. Dept. of Agriculture.

The committee also reported that in addition to its recommendations regarding the adoption of the proposed method for the determination of the specific gravity of coarse aggregates and the definitions preceding, the joint conference previously referred to had under consideration methods proposed by Committee D-4 for the determination of the specific gravity of sand and other fine highway material, and of voids in mineral aggregates; and was also considering definitions for "filler," "grit," "loam," "screenings," and "silt."

The committee also submitted as a part of its report a discussion of British standard nomenclature as compared with the nomenclature adopted by the society. This was included because of the publication of a report on "British Standard Nomenclature of Tars, Pitches, Bitumens and Asphalts" by the Engineering Standards Committee of Great Britain.

The Effect of the War Upon Nevada Road Work

A recent report from State Highway Engineer R. K. West of Nevada is to the effect that there is available for state road work during 1917, $40,000 from the general fund of the state and about $30,000 in automobile taxes collected during the past year. The major portion of these funds will be used for making surveys, plans and estimates for next season's work and at present it is not expected that any of the money will be used this season for either construction or maintenance.

As the department has only recently been created, Mr. West reports, it is impossible to make comparisons with the expenditures of previous years.

Development of Trunk Line System in Texas

Plans for the construction of a complete system of trunk line highways in the state of Texas were thoroughly discussed at a joint meeting of the State Highway Commission and the Texas Good Roads Association, held recently at Mineral Wells. The prospective road work to be done during the coming two fiscal years was taken up, and it was found that approximately $24,000,000 would be available for improvements during that period.

To facilitate engineering operations, the state has been divided into six districts, the headquarters and areas of which are as follows:

1. Dallas: All counties east and including Limestone, Navarro, Ellis, Dallas, Collin and Grayson, and north of and including Freestone east to Sabine.

2. Fort Worth: Roughly, the counties contained in a line drawn around Falls and Bell, Coleman, Hardeman and Cooke back to the starting point.

3. Amarillo: All the Panhandle with the tier of counties from Gaines east to Jones as the southern boundary.

4. Houston: All of southeast Texas bounded by the line of the Dallas district on the north, along the west border of Milan County and the west border of Calhoun County.

5. San Antonio: From Refugio and Aransas Counties south to Cameron, northeast to Kinney and north to Concho, including all the counties named. Bounded on the north and northeast by districts previously outlined.

6. San Angelo: All the southwestern section of the state not included in the other districts.

Routes for twenty-five trunk highways to be constructed within the next two years have been designated. The proposed roads representing a total length of more than 8,000 mi., are as follows:

No. 1.—Texarkana, Dallas, Fort Worth and El Paso Highway: From Texarkana via Mount Pleasant, Mount Vernon, Sulphur Springs, Greenville, Rockwell, Dallas, Fort Worth, Mineral Wells, Abilene, Sweetwater, Colorado, Big Springs, Midland, Pecos, Sierra Blanca to El Paso.

Southern Route, Texarkana-Dallas Highway: Texarkana, via Atlanta, Linden, Dangerfield, Pittsburg, Winnsboro, Sulphur Springs.

Fort Worth-El Paso Highway from Palo Pinto to Abilene, two routes:

Northern Route: Through Caddo, Breckenridge, Albany and Abilene.

Southern Route: Through Strawn, Ranger, Eastland, Cisco, Putnam, Baird and Clyde to Abilene.

No. 2.—Meridian Highway: From Burkburnett, through Wichita Falls, Fort Worth, Meridian, Waco, Temple, Taylor, Austin, San Antonio to Laredo, with a branch from Waco to Marlin, Calvert, College Station, Navasota, Hempstead, Houston and Galveston. A branch may also be designated from Wichita Falls through Brady, San Saba and Fredericksburg. A branch route was officially designated from Henrietta to Jacksboro, Mineral Wells, Weatherford, Granbury and Meridian.

No. 3.—Southern National Highway: From a point 20 mi. east of Orange on the Sabine River through Orange, Beaumont, Houston and San Antonio to Del Rio.

No. 4.—Del Rio-Canadian Highway: From Del Rio through San Angelo, Sweetwater, Childress, Canadian and Ochiltree to the state line.

No. 5.—North Texas Highway: From Texarkana to Paris, Sherman, Gainesville, Wichita Falls, Childress, Amarillo and Texline.

No. 6.—King of Trails: From a point 6 mi. north of Denison on the Red River through Denison and Dallas to Waco.

No. 7.—Central Texas Highway: From a point on the Sabine River directly east of Newton through Newton, Crockett, Waco to San Angelo.

No. 8.—East Texas Highway: From a point on the Red River north to New Boston through New Boston, Linden, Jefferson, Marshall, Carthage, San Augustine, Jasper, Beaumont to Port Arthur.

No. 9.—Puget Sound-to-the-Gulf Highway: From Corpus Christi through San Antonio, Fredericksburg, Brady, San Angelo, Big Springs and Lubbock to Amarillo.

No. 10.—Fort Worth, Brady and Fort Stockton Highway: From Fort Worth through Comanche, Brady, Sonora, Fort Stockton and Alpine to Sierra Blanca.

No. 11.—Jefferson Highway: From a point on the Red River 6 mi. north of Denison to Denison, Greenville, Mount Pleasant, Longview and the state line east of Marshall.

No. 12.—Jefferson Davis Memorial Highway: From a point on the Sabine River east of Orange through Orange, Houston, Wharton, Victoria, Kingsville to Brownsville and thence along the Rio Grande Valley to El Paso; branch route from Lobo through Van Horn and north to the New Mexico line.

No. 13.—Ozark Trail: From Texaco through Amarillo and Wheeler, east to the state line.

No. 14.—Dallas-Houston Highway: From Dallas through Corsicana and Teague to Houston.

No. 15.—Dallas to Louisiana Highway: From Dallas through Tyler to Longview, there connecting with the Jefferson Highway.

No. 16.—Denton-Oklahoma Highway: From a point on the state line north of Gainesville south through Gainesville to Denton and thence to Fort Worth. One branch of the road from Denton will extend to Dallas, another from the same point through Aubrey, Pilot Point and Tioga, connecting with the North Texas Highway at Whitesboro.

No. 17.—Pecos Valley Highway: From a point on the state line north of Montclair through Montclair, Pecos and Barstow to Fort Stockton.

No. 18.—Albany Broncho Highway: From Albany through Aspermont, Dickens, Lubbock, Brownfield and Broncho. This may connect with the Fort Worth-Roswell Highway.

No. 19.—Paris to Houston Highway: From a point on the Red River north of Paris to Paris, Terrell, Tyler, Palestine, Crockett, Huntsville and Houston.

No. 20.—Austin-Houston Highway: From Austin through Giddings, Brenham, Hempstead to Houston.

No. 21.—Gonzales-San Augustine Highway: From Gonzales through Giddings, Crockett, Nacogdoches and San Augustine east to the state line. This is the old King's Highway.

No. 22.—Wichita Falls to Comanche Highway: From Wichita Falls through Archer City and Breckenridge to Comanche.

No. 23.—Fort Stockton to El Paso.

No. 24.—Old Southern Trail: From Burkburnett through Wichita Falls, Archer City, Throckmorton, Albany, Baird, Mason, Fredericksburg, Boerne, San Antonio and Laredo.

No. 25.—Fort Worth to Hillsboro: Connecting with No. 6 at Hillsboro.

Bond Issue and New Motor Law for Illinois

House Bill 559, generally known as the Meents Bill, which provides for a $60,000,000 road bond issue, has been signed by Governor Frank O. Lowden, of Illinois.

Passage of the bill by the Legislature was noted in "Good Roads" for June 23. It provides for the building of about 4,500 mi. of roads and must be ratified by the voters of the state at the election in 1918. The bonds are to be retired within 20 years.

The new motor law also passed will eventually more than double the license fees on motor vehicles. It provides a schedule of rates to take effect on January 1, 1918, and another to take effect January 1, 1920. These schedules, with the present rates, are shown in the following table:

Type of Vehicle.	Rates		
	1917.	1918.	1920.
Automobiles:			
10 hp.	$3.00	$4.50	$6.00
10-25 hp.	4.00	6.00	8.00
25-35 hp.	6.00	9.00	12.00
35-50 hp.	8.00	16.00	20.00
Over 50 hp.	10.00	20.00	25.00
Trucks:			
2-ton	5.00	10.00	12.00
Over 2-ton	10.00	20.00	25.00
Motorcycles	2.00	3.00	4.00

The law provides that the proceeds shall constitute a road fund that may be used for only two purposes—for the improvement of the highways of the state or for the payment of the principal and interest on any bonded indebtedness incurred by the state for road construction.

It is planned to use the fund for the retirement of the proposed $60,000,000 bond issue.

Roads of Fairmount Park, Philadelphia, Pennsylvania

From a report on the condition of the driveways in Fairmount Park, Philadelphia, it appears that the enormous increase of automobile traffic has produced a state of disintegration over a number of miles of the most beautiful portions of the roadways, notably the East Park Drive and the lower Wissahickon Drive which form a popular thoroughfare to the suburbs.

Figures for the year 1916 show that there was an increase of 50% in the number of cars passing through the park over the previous year. Automobiles using the park roads last year numbered 2,258,729, and, according to the report, it is estimated that the number for 1917 will approximate 4,000,000, practically all pleasure cars. A special permit is necessary for commercial vehicles. The number of one-horse vehicles using the park drives last year increased to 57,257, while the number of two-horse vehicles decreased.

In the maintenance of the park, a strict surveillance is kept over the roads to prevent the use of tire chains. The highways are of a bituminous type on the central portion, the sides being paved with water bound macadam, for the use of horse-drawn vehicles.

About five years ago an appropriation of $200,000 was made for the maintenance of the park roads. This has been used, and the Park Commission estimates that $100,000 is necessary at once to keep the driveways in proper condition.

Bond Issue Bill Passed by the Pennsylvania Legislature

A resolution to amend the constitution to permit issuing road bonds to the amount of $50,000,000 has been passed by the House of Representatives of the Pennsylvania Legislature by a vote of 115 to 61. The Senate has already passed the measure and it will be submitted to the people at the general election in November, 1918.

A similar proposition was defeated at the polls in 1913 and the opponents of the present plan will seek to defeat it next year. The State Grange has consistently opposed a bond issue for roads and, according to reports, will continue to work for its defeat.

County Engineers of Kansas Approved

The county engineers named in the following list have received the approval of the State Highway Commission under a requirement of the new highway law of Kansas:

Atchison County, R. D. Coleman; Cherokee County, C. M. Cooper; Ford County, T. J. Schall; Harper County, C. C. Eastman; Labette County, W. J. King; Lyon County, W. S. Ruggles; Marshall County, R. F. Gallup; McPherson County, H. A. Rowland; Montgomery County, H. K. Hibbard; Morris County, A. E. Smith; Nemaha County, L. P. Price; Osborne County, H. L. Parker; Reno County, W. B. Harris; Smith County, G. P. Myland; Washington County, Wm. S. Henderson; Wilson County, H. S. McFadden.

Township Supervisors' Reports in Pennsylvania

First Deputy State Highway Commissioner Joseph W. Hunter has recently notified township supervisors of towns of the second class that their reports must be filed with the State Highway Department before August 1.

This action is taken in preparation for the distribution to the second-class townships of the cash tax bonus for the maintenance of earth roads. The reports should have been filed by January 1 and unless the reports are filed by August 1, the townships cannot share in the appropriation of $1,873,470, made by the Legislature for the payment of the amounts due. If favorable action is taken on this appropriation by Gov. Brumbaugh, the State Highway Department will immediately begin the distribution of the fund.

Experimental Use of Convict Labor in Maryland

A plan for trying out the work of convicts in repairing state roads is being put into operation in the state of Maryland. The work will begin in Baltimore County, with a force of 18 prisoners, and the number will be increased to 100 if the plan is successful.

The prisoners selected for the initial experiment are what are known as "short termers," and it is thought that their employment on the highways will not only prove advantageous to the state, but may result in some benefit to the indvidual workers. The arrangement between the State Board of Prison Control and the State Roads Commission places the force under guard of the penitentiary. The convicts work in civilian dress and will receive a money compensation. It is stated that scarcity of other labor is responsible for the experiment being made at this time.

MEETINGS

Calendar of Coming Meetings

July 9-11.—North Carolina Good Roads Association.—Annual meeting, Asheville, N. C. Secretary, Dr. Joseph Hyde Pratt, Chapel Hill, N. C.

July 10-11.—Pikes Peak Ocean to Ocean Highway Association.—Midsummer meeting, Colorado Springs, Colo. Secretary, A. W. Henderson, Colorado Springs, Colo.

July 10-12.—Municipal League of Indiana.—Annual convention, Shelbyville, Ind. Secretary, W. S. Jones, Shelbyville, Ind.

July 26-27.—League of Michigan Municipalities.—Annual convention, Grand Rapids, Mich. Secretary, Charles A. Sink, Ann Arbor, Mich.

August 15-17.—League of Wisconsin Municipalities.—Annual convention, Racine, Wis. Secretary, Ford W. MacGregor, Madison, Wis.

August 22.—Union of New Brunswick Municipalities.—Annual convention, St. John, N. B. Secretary, James King Kelley, St. John, N. B.

August 27-29.—Union of Canadian Municipalities.—Annual convention, London, Ont. Secretary, W. D. Lighthall, K. C., Westmount, P. Q.

Cement Products Exhibition Co.

The Cement Products Exhibition Company has announced that because of existing conditions it has been decided not to hold the usual Chicago cement show next winter. It is stated that if any change is made in the present plans an announcement will be made at a later date.

League of Texas Municipalities

The Fifth Annual Convention of the League of Texas Municipalities was held at Dallas, Texas, June 20, 21 and 22, the session on Thursday, June 21, being held jointly with the Texas Town and City Planning Association and the session on Friday morning, June 22, being a state-wide conference for co-ordinating public health agencies in the state.

Among the speakers on Thursday were George E. Kessler of St. Louis, Mo.; Mrs. J. L. Young, president of the Civic Club of Mineral Wells, Mrs. Florence C. Floore, Civics Chairman of the Texas Federation of Women's Clubs, and a number of city officials.

American Society for Testing Materials

The twentieth annual meeting of the American Society for Testing Materials was held at the Hotel Traymore, Atlantic City, N. J., on Tuesday, Wednesday, Thursday and Friday of last week, as was noted briefly in "Good Roads" for June 30. The session of most interest to road builders was the sixth, held on Thursday afternoon, at which the meeting received the report of Committee D-4, on Road Materials, Logan Waller Page, Director, U. S. Office of Public Roads and Rural Engineering, Chairman, and papers were presented as follows: "Determination of Absolute Viscosity by the Saybolt Universal and the Engler Viscosimeters," by Winslow H. Herschel; "Effect of Controllable Variables on the Toughness Test for Rock," by F. H. Jackson, Jr., and "A New Consistency Tester for Viscous Liquid Bituminous Materials," by Prevost Hubbard and F. P. Pritchard.

Other papers and reports bearing more or less directly upon road work were presented at other sessions as follows:

Second session, Tuesday afternoon: "Distribution of Pressure Through Earth Fills," by A. T. Goldbeck, and "A Method for Studying the Effects of Temperature Upon the Physical Condition of Asphalts, Waxes, etc.," by J. A. Capp and F. A. Hull.

Seventh session, Thursday evening: Report of Committee C-1, On Cement, R. S. Greenman, Chairman; "The Economical Proportions for Portland Cement Mortars and Concretes," by J. A. Kitts; "Effect of Rate of Application of Load on the Compressive Strength of Concrete," by D. A. Abrams; and "Tests of Concrete Slabs to Determine the Effect of Removing Excess Water Used in Mixing," by A. N. Johnson.

Eighth session, Friday forenoon: Report of Committee C-2, On Reinforced Concrete, F. E. Turneaure, Chairman; Report of Committee C-9, On Concrete and Concrete Aggregates, S. E. Thompson, Chairman; "Tests of Concrete Road Aggregates," by J. P. Nash; "Apparent Specific Gravity of Non-Homogeneous Fine Aggregates," by A. S. Rea; and "Effects of Grading of Sands and Consistency of Mix Upon the Strength of Plain and Reinforced Concrete," by L. N. Edwards.

At the sixth session on Thursday forenoon the report of Committee D-4 was presented by the secretary of the committee, Prevost Hubbard. The report is reviewed on other pages of this issue. Mr. Hubbard announced that the report had been submitted to the committee by letter ballot and that of the 41 members 34 had voted affirmatively and 7 had not voted. Upon a motion by Mr. Hubbard, seconded by Mr. Page, the report was accepted by the society.

The paper on "Determination of Absolute Viscosity by the Saybolt Universal and the Engler Viscosimeters," presented by Mr. Herschel at this session, was discussed at some length. The paper was a technical discussion of the use of viscosimeters, especially of the two types mentioned, and was of interest chiefly to chemists and testing engineers.

F. H. Jackson's paper on the "Effect of Controllable Variables on the Toughness Test for Rock" was discussed by Logan Waller Page and L. Reinecke of the Geological Survey of the Canadian Department of Mines and others. Both Mr. Page and Mr. Reinecke especially emphasized the necessity for using a large number of samples from different parts of the quarry in order to obtain average values.

The paper "A New Consistency Tester for Viscous Liquid Bituminous Materials," prepared by Prevost Hubbard and F. P. Pritchard, was presented by Mr. Hubbard, who briefly abstracted the paper, exhibiting one of the machines.

The Eldorado-Augusta-Douglas Good Roads Club has been organized in Butler County, Kansas, with the object of carrying on a systematic campaign to secure the improvement of the road from Eldorado to Douglas, a distance of 28 mi. It is asserted by those who are behind the movement that the road is one of the most important thoroughfares in the state, serving a large traffic from the oil fields of the county. The club has already secured several hundred members in the towns connected by the highway.

Highway Improvement in Philadelphia, Pa., for which bids were recently received, will cost an estimated sum of $650,000. This includes work on the Parkway to cost $300,000. The portion affected lies east of Logan Square. It is proposed to construct a driveway 33 ft. wide extending from City Hall Plaza to 15th St., in addition to other work.

PERSONAL NOTES

Thomas Maddock has been appointed State Engineer of Arizona.

Christopher Johnson has been appointed City Engineer of Warrensburg, Mo.

Theodore Tobish has been appointed Township Engineer of Hamilton, Mercer County, N. J.

H. B. Olmsted has been appointed Superintendent of Highways and Bridges of Darien, Conn.

Robert L. Fox, formerly City Engineer of Batavia, N. Y., has been made Assistant Engineer on sewer work at Johnstown, Pa.

Edward G. Kane has resigned as Commissioner of Public Works at Anaconda, Mont., to accept a position with the Anaconda Copper Mining Co.

Prof. Arthur D. Winslow, head of the Civil Engineering Department of Norwich University, has been appointed City Engineer of Montpelier, Vt.

W. I. Risley, City Engineer of Ventnor City, N. J., has been granted a six months' leave of absence for training with the Engineer Officers' Reserve Corps.

C. C. Cottrell has been appointed Assistant Highway Engineer of Nevada. Mr. Cottrell was formerly connected with the California Highway Commission.

R. D. Goodrich, former Manager of Public Utilities of Ypsilanti, Mich., has been appointed City Manager of Lansing, Mich. Mr. Goodrich was at one time City Engineer of Cheyenne, Wyo.

J. R. McDermott has been made Field Inspector with the Portland Cement Association. Mr. McDermott, who was formerly Road Inspector of Trumbull County, O., will have his headquarters at Pittsburgh, Pa.

W. H. Ellis has been appointed Commissioner of Public Works of Anaconda, Mont., succeeding Edward G. Kane, whose resignation is noted elsewhere. Mr. Ellis has been serving as Assistant City Engineer.

Chas. J. Deckman has resigned as president of the Medal Paving Brick Co., of Cleveland, O., effective July 1. Mr. Deckman, who has been connected with the paving brick industry for the past 30 years, retains his interest in the Medal Company.

A. W. D. Hall has been made City Manager of Jackson, Mich., succeeding Gaylord Cummin, who, as noted in "Good Roads" for May 19, recently resigned to become City Engineer of Grand Rapids, Mich. Mr. Hall was formerly City Engineer of Jackson.

J. G. Kaulfuss has been appointed to act as field man and publicity agent for the North Dakota State Highway Commission. Mr. Kaulfuss has been connected with the Wisconsin State Highway Commission, the State Highway Commission of Maine, the University of Maine and the Office of Public Roads.

Henry G. Lehrbach, C. E., of the Dunn Wire-Cut Lug Brick Co., has been appointed an assistant civil engineer in the U. S. Navy. Mr. Lehrbach's appointment was one of twenty-five made by President Wilson on June 21. Mr. Lehrbach is a graduate of the School of Engineering, Cornell University, and for a time was engaged in state highway work in New York. In 1915 he resigned to join the engineering staff of the Dunn Wire-Cut Lug Brick Co., of Conneaut, O. For a while he was division engineer of the Atlanta, Ga., division, but later was transferred to the district having its headquarters at Columbus, O.

W. Eights has been appointed Assistant Engineer of the Indiana State Highway Commission.

John W. Bulger has become connected with the County Engineer's office of Cochocton County, O.

Eugene Somers, Assistant Engineer in the Engineering Department of Woonsocket, R. I., has been appointed Acting City Engineer of Ventnor City, N. J., during the absence of W. I. Risley, who, as noted elsewhere in this column, has been granted a six months' leave of absence. Mr. Somers was at one time assistant to the County Engineer of Atlantic County, N. J.

W. H. Dayton has joined the Walter A. Zelnicker Supply Co., of St. Louis, Mo., as city salesman. Mr. Dayton was formerly with the Railroad Supply Co. of Chicago, Ill., as secretary and purchasing agent and later as eastern representative. Seven years ago he came to St. Louis to represent the Railroad Supply Co., and also the Chicago Signal & Supply Co., and the Elyria Iron & Steel Co.

PUBLICATIONS

INSTRUCTIONS TO ENGINEERS MAKING ROAD SURVEYS. Department of Public Roads of Kentucky; Bulletin No. 9; paper, 4½x7¼ in.; 29 pp. and covers; illustrated; inset.

This bulletin, which contains detailed instruction for making surveys for road work, is designed, according to an introductory note by Commissioner Wiley of the Kentucky Department of Public Roads, "for the guidance of persons who have had experience in highway or railroad surveying." The text is illustrated by numerous diagrams, plans, etc., one of them, printed as an inset, being a plan and profile of a road survey drawn in accordance to the department's standards.

NEW YORK, N. Y., BOROUGH OF MANHATTAN. Annual report of the business and transactions of the President, for the year ending Dec. 31, 1915; paper, 6¾x10 in.; 297 pp. and covers; illustrated; inset tables, charts and maps.

Included in this report are the general report of the borough president, the report of the Department of Public Works and the report of the Bureau of Buildings. The report of the Department of Public Works contains reports of the Bureaus of Highways, Sewers, Topography, and Public Buildings and Offices, the report of the Highway Bureau occupying 52 of the 177 pages included in the report. Included in the report of the Bureau of Highways are, besides a general report, an organization chart of the bureau, a list of the chief officials and several appendices containing detailed data on the operations of the bureau. The report is profusely illustrated by half-tone illustrations and by charts and diagrams.

NEWS NOTES

The Commissioner of Public Works of Pawtucket, R. I., has called for bids on 5,400 sq. yd. of granite block pavement for Broad St. in that city. The pavement is to be laid on a concrete base.

A Bond Issue of $1,100,000 Was Voted in Harris County, Texas, on June 27. Of the total amount $1,000,000 will be spent for surface treating 236 mi. of shell and gravel roads, and the remainder will be spent for the construction of concrete pavements.

Good Roads Day Was Observed in Minnesota on June 19. Although data on the exact amount of work done is not available, it is understood that the observance was general throughout the state, the Governor having issued a proclamation designating the day, and the State Highway Department having sent requests to road engineers to arouse interest in their particular districts.

GOOD ROADS

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Number 2

Methods and Costs of Road Maintenance, Repair and Reconstruction in New York State in 1916

A detailed description of the maintenance, repair and reconstruction of improved state and county highways in New York during last year is given in the annual report of Second Deputy Commissioner Fred W. Sarr, of the State Commission of Highways. Some of the principal points in the report, which covers the calendar year of 1916 and has recently been made public, are reviewed in the following pages.

On April 1, 1916, according to the report, there were 5,959 mi. of completed and accepted state and county highways outside the limits of cities which, during the working season of 1916, were maintained, repaired, and in some instances, reconstructed under the supervision of the department. The highway law permits the work to be performed either by contract or directly by the department, and because of the magnitude of the work it has appeared desirable to do by contract "so much of the work as can be properly anticipated and which can be expressed in comprehensive contract units." During the year contracts were awarded for work as follows:

Reconstruction of highways with a different type of improved surface, 16.6 mi., 14 contracts, total cost $268,822; resurfacing badly worn concrete, macadam and gravel pavements, 185.5 mi., 62 contracts, total cost $1,103,493; heavy surface treatment of macadam pavements, 53.3 mi., 10 contracts, total cost $169,825; light surface treatment of concrete and macadam pavements and gravel surfaces, 1,445.7 mi., 56 contracts, total cost $491,831; furnishing bituminous material for the use of department forces, 2,633,960 gal., 25 contracts, total cost $224,250; furnishing and delivering broken stone for the use of department forces, 5,475 cu. yd., 3 contracts, total cost $15,907.

The work done with departmental equipment, labor and materials included the following items:

Maintenance by the patrol system of 5,459 mi. of low grade concrete and macadam pavements and gravel surfaces, $654,746; light surface treatment of 423 mi. of low grade concrete, macadam and gravel, $85,810; restoring in a permanent manner 243,880 sq. yd. of macadam which had broken through under traffic during the spring, $326,400; making extraordinary repairs caused by cloudbursts and floods, $71,042; making miscellaneous repairs to pavements, shoulders and gutters, with gangs, 2,600 mi., $772,628.

In November, 1915, according to report, the division engineers made a survey of all the improved highways and recommended that about 413 mi. be resurfaced with a wearing course of macadam, laid over the old surface as a foundation, or that the road be repaved with a different and more permanent type of pavement. The limited funds available were not sufficient for the mileage recommended and only 202 mi. were completed. Of this total mileage, 14.3 mi. were reconstructed with first-class concrete pavement at a cost of $11,787 per mi.; 2.33 mi. with vitrified brick on a concrete foundation at a cost of $26,114 per mi.; 142.9 mi. were resurfaced with 2½-in. bituminous macadam, with considerable new foundation where pavements were broken or had shown

Before Repairing. After Repairing.

AUBURN-SENECA FALLS, COUNTY HIGHWAY NO. 590, CAYUGA COUNTY, NEW YORK—BITUMINOUS MACADAM CONSTRUCTION.

weakness, at a cost of $5,901 per mi., and 42.7 mi. were resurfaced with 3-in. water bound macadam, with considerable new foundation, at a cost of $5,105 per mi.

The increase in cost of resurfacing over similar work in 1915 was due principally, according to the report, to the larger amount of new foundation required, the estimated cost of this additional work being about $450 per mi.

Heavy surface treatment, according to the report, is sometimes applied instead of resurfacing, the work being done in a manner similar to the construction of bituminous macadam pavements, the new stone increasing the thickness by about 1 in. The average cost of this work is about $3,000 per mi. It is undertaken only where the old pavement has sufficient stability but has a rough and uneven surface which it is desired to correct.

Trouble was experienced because of delays in the deliveries of bituminous materials and crushed stone for the use of the department. During the season the former practice of purchasing broken stone was discontinued and the only contracts awarded were those for furnishing stone that must of necessity be crushed locally. The results were much better, according to the report, especially where material could be obtained from commercial quarries so situated that it could be purchased and delivered as required.

TABLE I—EXPENDITURES MADE DIRECTLY BY THE NEW YORK DEPARTMENT OF HIGHWAYS, DURING THE YEAR 1916.

Patrolmen	$436,497.00
Foremen, laborers, mechanics and teams	685,860.00
Purchase of materials	515,000.00
Purchase of equipment and tools	67,089.00
Rental of equipment and tools	33,696.00
Rents, office and storage	8,456.00
Purchase of supplies	15,323.00
Advertising	8,706.00
Engineering salaries	280,028.00
Engineering expenses, travel and livery	62,175.00
Total	$2,112,830.00

Considerable space is given in the report to the subject of patrolmen. The former practice of the department, it is stated, was continued by assigning the patrolmen to sections of macadam and gravel road, each man having in his charge from 4 to 7 mi. of road. The efficiency of this system as compared with the gang system has been questioned, according to the report, and in certain sections where a gang could be operated to advantage the patrol system was suspended temporarily and the maintenance performed by gangs. It was found that while the gang would unquestionably do more efficient work than the average patrolman, this greater efficiency was more than offset by the magnitude of the work which had to be done. The superiority of the patrol system applies chiefly to water bound macadam and gravel roads subjected to any considerable amount of motor vehicle traffic. In the case of bituminous macadam, first-class concrete and brick pavements, which do not deteriorate rapidly, it is questionable, according to the report, whether a gang patrol is not more efficient than patrolmen. During 1916, few, if any, patrolmen were employed on pavements of this character, the necessary repairs being taken care of by temporary gangs. With a few exceptions, this plan worked out satisfactorily, the exceptions being in those cases in which it was difficult to obtain temporary local labor at the time needed.

TABLE II—COST OF MAINTENANCE, REPAIR AND RECONSTRUCTION OF HIGHWAYS IN NEW YORK STATE IN 1916.

Type of improved surface—	Mi. of improved highways of each type.	Expenditures per mi. during 1916, for maintenance and repair, exclusive of reconstruction to different type.	Total expenditures per mi., during 1916, including reconstruction to a more permanent type of surface.
Block pavements:			
Brick	267.23	$176.00	....
Asphalt	15.86	78.00	....
Wood	0.23	52.00	....
Stone	1.69	46.00	....
Brick cubes	0.33	188.00	....
Concrete:			
First-class	151.68	141.00	....
Second-class	238.30	1,080.00	....
Hassam	60.24	412.00	$695.00
Bituminous macadam:			
Mixing method:			
Amiesite, concrete base	1.24	148.00	....
Amiesite, macadam base	4.07	112.00	....
Topeka, concrete base	25.21	205.00	....
Topeka, macadam base	6.64	256.00	....
Open mixed, concrete base	6.54	117.00	....
Open mixed, macadam base	11.92	686.00	....
Bitulithic, concrete base	13.17	150.00	....
Henderson, macadam base	1.11	1,769.00	....
Gravel, mixed gravel base	2.55	300.00	....
Penetration method:			
Asphalt binder	2,534.89	493.00	506.00
Tar	97.90	234.00	....
Sub-base bituminous surface	22.93	681.00	....
Water bound macadam	2,391.37	906.00	971.00
Gravel	173.78	587.00	1,056.00
Kentucky rock asphalt	17.55	331.00	....
Rocmac	1.39	532.00	....
Total, all types	6,047 82	$651.00	$698.00

The equipment and tools purchased during the season included 12 steam road rollers, three 3-ton motor trucks, one 5-ton motor tractor, a 1,000-gal. pressure distributor and a 5-ton stone truck. Because of the insufficient amount of equipment owned by the state, it is necessary to rent more or less equipment. Often because of the isolated location of the work, it is more advantageous to hire a local steam roller, if possible, than to ship in a department roller for a few days' work. For the rental of large units of equipment, fixed unit prices are established and are generally accepted by those having equipment to rent.

A central storehouse is maintained during the entire year for the equipment owned by the department, and the report recommends the erection of temporary buildings for storage purposes at various central points throughout the state.

The funds expended directly by the department were divided as shown in Table I. The total, $2,112,830, added to the $2,180,872, representing the value of 170 contracts for reconstruction and for furnishing materials, to which reference has been made, brings the total of expenditures and contract obligations of the department for the year to $4,293,702. Of this amount, engineering salaries amounted to approximately 7% of the total expended.

The cost of maintenance, repair and reconstruction of the large mileage of roads under the control of the Department has been segregated and charged against the roads of the various types as shown in Table II. The report comments on these costs in part as follows:

> An extraordinary expenditure of $71,042, which was required to restore to normal condition sections of improved highways that were damaged by cloudbursts and flood, has not

been distributed to the particular type of pavement in which class the highway damaged belonged, in that the type of pavement had no bearing on the extraordinary expense.

The average cost per mile for maintenance and repair is obtained by dividing the total expenditures on all improved highways of a particular type by the total number of miles of such type, including the cost of new surfaces in the case of macadam and second class concrete, but not including the cost of reconstructing or further improving the highway with a different and more permanent type of pavement, such as the reconstruction of a gravel road with a new macadam or concrete pavement or the reconstruction of a macadam or Hassam pavement with a new concrete or brick pavement.

The total average cost per mile includes all expenditures on highways of each type and includes the cost of reconstruction or further improvement of the highway with a pavement of a different and more permanent type, which reconstruction was made necessary by the increase in traffic, since the first improvement of the highway, to such an extent that the former type of improvement was no longer suited to the traffic to which the highway is now subjected. While this expenditure is not properly a charge of maintenance against the original type of improvement, still it is a factor to be considered in designing and improving a highway with the cheaper and more temporary types of pavement, and the cost of such reconstruction of a few miles of old pavement has been distributed over the entire mileage of the former type as an indication of what may be expected in the maintenance of such types of pavement.

TYPICAL WASHOUT ON A BITUMINOUS MACADAM ROAD IN ONONDAGA COUNTY, N. Y.

Too much weight should not be given to the tabulated costs per mile of the types represented by very small mileage; conversely the data on types of considerable mileage and wide distribution should represent with a reasonable degree of accuracy the average cost of maintenance of pavements of the particular type.

In view of the fact that the traffic is not confined to the pavement by curbs, and the earth shoulders are a part of the traveled roadway, the cost of the maintenance of pavement has not been segregated from that of the shoulders, and the figures quoted represent the cost of maintaining the entire roadway. This method would seem more consistent for purposes of comparison for the reason that the cost of maintenance of the shoulders of those pavements having a general low cost is much higher than for maintaining the shoulders on those pavements which have a general high cost.

The year of 1916, according to the report, was one of unusual conditions as regards the maintenance of improved roads. During the spring months, the surfaces of many of the improved roads broke through under traffic to a greater extent than ever before in the history of the department. A survey was made of the damage and it was found that the total area thus broken amounted to 758,000 sq. yd., equivalent to 82 mi. of 16-ft. pavement. In general, the method used to repair these pavements is to excavate the area involved to a depth of from 12 to 15 in., lay a foundation of rough stone or coarse gravel 9 to 12 in. deep and restore the pavement, making provision for subdrainage. The cost of this, according to the report, will average about $1.30 per sq. yd., which would bring the cost of permanent repairs on the pavements broken up during the spring to about $1,000,000. In many counties the funds available were not sufficient to make such repairs as described and the pavements were leveled and covered with a thin crust of macadam.

JORDAN VALLEY ROAD, ONONDAGA COUNTY, NEW YORK—BEFORE REPAIRING.

The engineers who made the surveys of the broken pavements were requested to assign a reason for the break-up and, according to the report, of the reasons assigned 50% were poor drainage. This, according to the report, is the answer most easily assigned and readily accepted, but does not explain why the roads break up in the spring and not during a long rainy period in the fall, nor why they break up in some seasons and not in others. Deputy Commissioner Sarr is of the opinion that the causes resulting in the conditions noted are a wet season followed by an open winter or one with repeated freezing and thawing. Another reason for the excessive amount of broken pavements—according to the report, one of the principal reasons—is that the pavements were not built sufficiently strong to carry during the spring months the heavy loads to which the highways

JORDAN VALLEY ROAD AFTER MAKING REPAIRS—BITUMINOUS MACADAM.

are now subjected. A large portion of the improved road mileage of the state, it is reported, was designed for a gross load of only about 3 tons moving at a speed of 4 mi. per hour, while many of the roads have to carry gross loads of from 7 to 10 tons moving at a speed of from 12 to 15 mi. per hour.

During the summer of 1915, the division engineers were requested to report the improved highways which, in their opinion, were not structurally strong enough to withstand the traffic during the spring months. The total length so reported was 1,939 mi. This mileage was improved at a probable cost of $20,000,000. Another cause of unusual damage to roads during the year was the number of cloudbursts and floods in the western part of the state. The damage resulting from these causes in Steuben and Allegany Counties would have entailed a cost of over $100,000 for repairs. Expenditures made amounted to about $75,000.

Several pages of the report are devoted to a description of the work done by convict labor. This work was handled by two methods. Where work was within 20 mi. of the prison, the men were taken to the work each morning by motor truck and taken back each evening. By the other method, the convicts were kept in rented houses in the vicinity of the work, provisions being supplied from local sources and the camp maintained by additional prisoners. Four of these prison camps were supplied with men from Auburn and two from Great Meadow. Prisoners from Sing Sing were carried to and from their work each day.

The experience of the department, according to the report, "would indicate that within restricted limits it is more economical to transport the men from and to the prison daily than to maintain them in established local camps, but that about 10 mi. is the economical radius of operation from the prison center, and for work at a greater distance, the local camps are preferable."

In Division No. 6, four camps were established during the season. The total number of working days for the four camps, based on an 8-hour day, was 8,706, and the total cost, including the maintenance of convicts, equipment purchased and rented, materials used, etc., was $21,963.24. Subsistence for the camps was secured from Auburn Prison, provisions being delivered by an automobile truck. The cost of subsistence for convicts and guards amounted to 35.8 ct. per man per day.

Work was also done in the Albany Division and in Westchester County. In the Westchester County work, the men were brought from Sing Sing Prison each morning and were carried back at night. The work done comprised the repairing of 12.14 mi. of road surface, the cleaning of 17.4 mi. of shoulders and ditches and the application of oil and cover to 13.45 mi. of road, the work being done with the help of a state foreman, motor truck and chauffeur. The actual cost of the work was $2,237.36, divided as follows:

Chauffeur's salary	$ 358.33
State auto truck, expenses, depreciation, etc.	881.96
Foreman's salary	158.00
Team hire	20.63
Food and tobacco for convicts	818.44
	$2,237.36

The estimated cost to the state of doing this work, paying $2.50 per day for labor, would have amounted to $2,650, according to the report. The use of the convicts, therefore, made an apparent saving of approximately 16%. Deputy Commissioner Sarr believes that this saving could be materially increased by placing the men in camps along the road so that a full day's work could be obtained. Under the method used in Westchester County last season it was impossible to average more than 6½ hours on the job, the rest of the day being spent in transporting the convicts to and from work.

Good Roads Days in Alabama

In accordance with a law passed in 1915, Tuesday and Wednesday, Aug. 14 and 15, will be observed as "good roads days" in Alabama.

Various organizations in the state are cooperating to make the observance successful, among them the Alabama Good Roads Association, the Alabama Mail Carriers' Association, the Alabama Automobile Dealers' Association and the Alabama Farmers' Union.

Proposed Highway Laws for Georgia

Two bills designed to provide for the improvement of highways in the state of Georgia have been introduced in the Senate at the present session of the General Assembly. One seeks to amend paragraph 1 of Section 1 of Article 7 of the state constitution relating to powers of taxation by "providing that the powers of taxation over the whole of said state may be exercised by the General Assembly for the purpose of constructing, improving and maintaining state highways, and for other purposes." If the bill becomes a law the state will be empowered to make direct appropriations for road work, to supplement the Federal road fund, and to capitalize the state automobile tax road fund.

The other bill is a statutory measure and is intended to give to counties authority to raise funds for inter-county improvements by the issuance of bonds in accordance with the law, upon terms and conditions agreed upon by the counties cooperating.

Test of New Motor Tax Law in Texas

Automobile owners of Texas are interested in a suit which has been filed in the district court at Austin for the purpose of testing the constitutionality of the license tax of the new law creating the State Highway Commission. The case is that of P. S. Atkins vs. Curtis P. Hancock et al. Mr. Hancock is chairman of the State Highway Commission, and the other defendants are members of that body. The following allegations are made in the petition:

> That the so-called license or registration fee is not a mere license or registration fee, but is in reality, in fact and in law a tax; that the same is sought to be collected under the provisions of an act of the Thirty-fifth Legislature at its regular session, entitled Chapter 190 of the published laws, as amended at the first called session of said Thirty-fifth Legislature; that as shown by Section 16 thereof the said license or registration fee is designed as a tax to raise revenue; that as shown by Section 24 thereof the same is a tax and not a police regulation, being collectible from any one owning and operating an automobile or motor vehicle, whether or not same is operated upon a public road or highway; that as shown by Section 22 subject to the ordinary forms of taxation in this state being required to pay only a $1 fee; that it is a tax which will produce an annual revenue of approximately $2,000,000, whereas thereof it is a tax, non-resident owners of motor vehicles not the law can be properly and efficiently administered for a sum less than $100,000 per annum.

The petitioner cites the following as grounds on which he asserts the act is void:

> It is a violation of Section 11, Article VIII, of the constitution providing for the assessment and payment of taxes on property in the county where such property is located; that the act violates Section 1 of Article VIII, which provides for the taxing of property on its proportionate value, whereas under the new law the tax is arbitrarily fixed without regard to value upon what is called a horse power basis.

The plaintiff declares that the act is unjust and discriminatory, that it seeks to allow non-resident owners of automobiles to remain within the state for a period of 30 days without payment of tax, or longer than 30 days on payment of only $1, whereas the petitioner, who is a resident tax paying citizen, must, under the terms of the act, pay the full tax of his class per annum for the same privilege.

General Highway Traffic Law of New York

A uniform law for regulating the use of public roads and streets in the State of New York became effective on May 25. It applies to all cities and villages in the state, except New York City, and is known as the "general highway traffic law." The principal features of the law follow:

Section 10.—Pedestrians: Pedestrians walking upon the traveled part of a street and not the sidewalk shall, when meeting or passing vehicles, be subjected to and comply with the rules governing vehicles as to meeting, turning out and passing, except as to signals.

Section 11.—Stopping, turning, passing, and waiting of vehicles:

1. A vehicle turning into another street to the right shall turn the corner as near the right-hand curb as practicable.

2. A vehicle turning to the left into another street, shall, before turning, pass to the right of and beyond the center of the intersecting streets; provided, however, that if directed by a traffic officer the vehicle shall pass in front of instead of around the point of intersection.

3. In turning a corner of intersecting streets a vehicle shall be driven with extreme caution and under control.

4. A vehicle passing around a circle shall keep to the right from entrance to exit.

5. Vehicles turning around or crossing from one side of the street to another, except for the purpose of passing other vehicles or because of dangers in the streets, shall do so by turning to the left so as to head in the general direction of traffic after they have crossed the streets.

6. A vehicle in overtaking or meeting a street surface car which has been stopped for the purpose of receiving or discharging a passenger or passengers shall not pass or approach within 7 ft. of such car so long as such car is receiving or discharging passengers, except that in a city having a million or more population such vehicle shall not pass or approach within 8 ft. of such car except as indicated by a safety zone. In passing any street surface car extreme care must be used by the driver.

7. On an avenue, street or boulevard divided longitudinally by a parkway, walk, space for street surface cars, viaduct, zone of safety, cab stand, parking space or other similar obstruction, vehicles shall keep to the right of such division.

Section 12.—Right of way and operation of vehicles:

1. When in the performance of duty the following vehicles shall have the right of way: United States mail, police, fire, fire patrol, bureau of buildings, emergency repair of public service corporations, ambulances and the military; but this shall not relieve the driver or owner of any such vehicle from consequences of the arbitrary or careless exercise of this right for injuries inflicted.

2. No vehicle and no street surface car, except as provided in sub-division one of this section, shall be driven through a procession, except with the permission or by order of a police officer. If the procession takes more than five minutes to pass, it shall be broken and traffic allowed to go through.

3. Two vehicles which are passing each other in opposite directions shall have the right of way, and, except in cities and villages, no other vehicle to the rear shall pass or attempt to pass such two vehicles while they are passing each other.

4. Every driver of a vehicle approaching the intersection of a street or public road shall grant the right of way at such intersection to any vehicle approaching from his right; provided, that wherever traffic officers are stationed they shall have full power to regulate traffic.

5. A vehicle must not be so driven as to impede or obstruct the progress of the apparatus of the fire department or any official or employee of a city, town or village in the discharge of his duty at a fire. The driver of a vehicle must not drive through or within the established fire lines or over a line of fire hose. On the approach of fire apparatus, as evidenced by suitable and continuous warning or by street signals operated from fire headquarters, visible or audible one to another, indicating the route of the apparatus, the driver of a vehicle must immediately draw up such vehicle as near as practicable to the right-hand curb and parallel thereto, and bring it to a standstill, and the driver of a street car must immediately stop his car and keep it stationary until the apparatus has passed.

6. The vehicle having the middle line of the highway on its left shall have the right of way. In meeting both vehicles shall keep to the right, so as to insure safe passage, and this without regard to the middle line of the highway. Slowly moving vehicles must move as near to the curb as practicable; rapidly moving vehicles must occupy the space lying immediately next to and parallel with the middle of the highway.

7. A vehicle overtaking another vehicle shall pass on the left side of the overtaken vehicle and not pull over to the right thereof until entirely clear of it.

8. The driver of an overtaking vehicle shall signal his desire to pass an overtaken vehicle by a blast or stroke of the horn or other signaling device, and thereupon it shall be the duty of the overtaken vehicle, if possible to turn to the right so as to allow the overtaking vehicle a reasonable space in which to pass, or to warn by signal the impossibility of such passage.

9. It shall be unlawful for any person to drive a vehicle within a safety zone.

10. In all passing and overtaking such assistance shall be given by the occupants of each vehicle respectively to the other as the circumstances shall demand and either request by voice or signal, and each shall exercise care and caution to get clearance and avoid accident.

11. No vehicle shall emerge from an alley, stable, garage or other driveway except slowly and under control of the driver, who shall give a proper warning by voice or signaling device to passing vehicles and pedestrians.

12. The use of a motor muffler cut-out is prohibited on any highway within the limits of a city or incorporated village.

13. Gong and siren whistles shall not be used on any vehicles other than ambulances and vehicles operated by a police department, fire department, sheriff, authorized public utility company when on emergency calls and the U. S. mail and military service.

14. A person operating or driving a motor vehicle shall on signal by raising the hand or otherwise from a person driving, leading or riding a horse or horses or other draft animal bring such motor vehicle immediately to a stop, and if traveling in the opposite direction remain stationary so long as may be reasonable to allow such horse or animal to pass, and, if traveling in the same direction use reasonable caution in thereafter passing such horse or animal.

Section 13 of the law relates to signals. It requires a driver, when turning to the right or left, to warn those who are following, by the arm held in a horizontal position, or by "operating an adequate mechanical signal device." He must slow down and give "a timely and sufficient signal with his voice, horn or other signaling device" at street intersections, or on a curve or corner where the view is obstructed, and must use the same precaution on approaching a pedestrian who is on the street and not upon the sidewalk. In changing the course of a vehicle, the operator must see that the space will permit him to turn the car in safety, and he must signal his intention to do so to the traffic officer, or to other drivers. Adequate warning must be given before backing any vehicle.

Section 14, regulating the speed of vehicles, is as follows:

1. Reckless driving is prohibited. Every person violating this provision shall be guilty of a misdemeanor and shall be punished by a fine not exceeding $100 for the first offense; and by a fine not exceeding $100, or imprisonment not exceeding six months or by both such fine and imprisonment in the discretion of the court for a second or subsequent offense.

2. Upon approaching a bridge or passing a public hospital, fire-house or a school, the driver of any vehicle or street surface car shall proceed with extreme care and with vehicle or street surface car under control, provided local authorities have legible and visible signs posted, warning drivers of their approach to a bridge, fire-house, public hospital or school building.

3. Street surface cars shall be brought to a full stop and all other vehicles shall use extreme caution when approaching a crossing or place designated by the sign "traffic point." Local authorities shall have authority from time to time to designate by ordinance, rule or regulation such crossing or other places at which such sign shall be placed.

Section 15 authorizes the police commissioner, common council, board of aldermen, village trustees or any body having charge of streets to designate and mark safety zones, parking spaces and cab stands wherever required for the convenience and safety of the public. Before leaving a motor vehicle unattended, the emergency brakes must be properly adjusted. Without the authority of the driver, or person in charge, climbing upon a vehicle, sounding the horn, or interferring with the machinery or attempting to put the car in motion is prohibited, except that a driver may move another vehicle so placed that he cannot get his car out. When a vehicle is stopped parallel to the curb, the front wheel and rear wheel toward the curb must not be more than 6 in. distant from it, and only in one-way traffic streets may a vehicle be stopped with the left side to the curb.

Subdivision 7 of Section 15 provides that, except in an emergency or when advised to do so by a police officer, no vehicle shall be left standing within the intersection of any cross street; within 10 ft. of any crosswalk or street crossing or alley corner, except where traffic officers are on duty; within 10 ft. of any fire hydrant; in front of or within 15 ft. of either side of the entrance to any building where large assemblages of persons are being held, except to take on or discharge passengers or freight and then only for such length of time as is necessary for such purpose, or in any portion of any street where street surface cars stop to receive or discharge passengers except as otherwise provided.

A vehicle is not allowed to stop in any street except as near the curb as possible, except in cases of emergency or in permitting a pedestrian, vehicle or street car to cross its path. At the request of the operator of a vehicle the movement of which is obstructed or delayed by a vehicle standing in front of it, the driver of the standing car must move it immediately. A vehicle at the curb must give way to one about to receive or discharge passengers.

Section 16 provides that, except in parking space or when authorized by ordinance or regulation, no vehicle may be kept standing backed up to the curb except when loading and unloading, and then only for the time required to complete the work.

Section 17. Vehicles:

1. A vehicle when loaded with any material extending at least 4 ft. beyond its rear shall be provided with a red flag by day on the extreme rear end of such load.

2. No person shall drive any vehicle so constructed or closed in as to prevent the driver from having a clear view ahead and at the sides of such vehicle.

3. It shall be unlawful to make repairs to any vehicle in any street or public place in a city except in an emergency.

4. No person shall drive or conduct any vehicle which is known to him to be in such condition, so constructed or so loaded as to break down or become stalled.

5. Before removing any part of any vehicle, or any part of any harness whose removal is likely to cause accident or permit a horse or horses attached to said vehicle to run away, the horse or horses shall first be unhitched from said vehicle by the person in charge.

6. The use of a vehicle in any city or village is prohibited when it is so loaded with iron or other material as to create loud noises while in transit.

7. A vehicle unless confined to tracks shall not tow more than one other vehicle, and the connection between the two vehicles shall not be longer than 16 ft., except that nothing in this clause shall prevent the use of more than one trailer. Each towed vehicle, except a trailer, shall have an attendant.

Section 18. Street Surface Cars:

1. During blockades or stoppages a clear space of 10 ft. shall be kept open between street cars opposite any alley or the center of the block if there be no alley.

2. Subject to the provisions of Subdivision 1 of Section 12, and except by order of a member of the police force in the discharge of his duty, street cars shall have the right of way between cross streets over all other vehicles. Every street surface car shall, by any signal approved by the public service commission, warn all traffic in its rear of the stopping or turning of such car.

3. The driver of any vehicle proceeding upon the tracks in front of a street car shall turn out as soon as possible upon signal of the operator of the street car.

Section 19. Motorcycles, Bicycles and Similar Vehicles:

1. No person in any city shall ride any motorcycle, bicycle or other vehicle propelled by the hands or feet of the rider along or upon any public sidewalk or footpath intended for the use of pedestrians. This section shall not apply to children under ten years of age and to persons who cannot walk by reason of being invalids or crippled.

2. No person shall drive or ride a motor vehicle, motorcycle or bicycle in the streets of any city, town or village without having a hand on the handle bars or steering device.

3. The driver of a two-wheeled motorcycle or a bicycle shall not carry any other person thereon, except on a seat securely fastened to the machine in the rear of the driver and provided with foot rests and hand grips.

4. Bicycles shall be provided with a bell which may be heard at least 100 ft. distant, also a lamp of such illuminating power as to be visible 200 ft. ahead. Such lamp shall be lighted whenever the vehicle is ridden at any time between one-half hour after sunset and one-half hour before sunrise.

Section 20. Miscellaneous Regulations:

1. No person shall ride upon the rear of any vehicle without the consent of the driver nor with any part of his body protruding, nor shall any person hang on to any street car or vehicle whatsoever.

2. On all automobiles requiring cranking from the streets the driver thereof shall cause the brakes to remain set until after the engine is started.

3. No races or contests for speed shall be held upon any street without the permission of the authorities of the state, city, town or village having jurisdiction of such street and unless the same is fully and efficiently patroled for the entire distance over which such race or contest is to be held.

4. No person shall coast with hand sleds, bobs, carts or other vehicles, on wheels or runners upon any public sidewalk in any city; nor shall any person coast with hand sleds, bobs or carts or other vehicles on wheels or runners upon any public street of the city except upon such streets as may be designated by the common council, board of aldermen or commission thereof.

5. No motor vehicle shall be operated in such a way as to emit unnecessary smoke or unnecessary offensive vapors within the streets of any city, town or village.

6. No person shall fail, neglect or refuse to comply with any law.

7. No person shall fail, neglect or refuse to comply with any lawful instruction, direction or regulation displayed upon post, standard, sign or device installed or placed for the regulation, direction or instruction of traffic in any public street.

Section 22 of the law authorizes the official bodies having charge of streets in cities and villages to designate one-way streets and directs them to mark such streets and post the rules and regulations relative thereto in conspicuous places. The section also authorizes the police department of a city or the president of a village to temporarily close any street or part of a street to vehicular traffic, or to vehicles of a certain description, when an accident or special emergency makes such action necessary. Under the same section local authorities may make rules, regulations or ordinaces excluding commercial vehicles from any park or any part of a park system, provided that notices to that effect are posted at each entrance to any park where such prohibition is made.

Section 22 also empowers local authorities to make and enforce such regulations in addition to those in the general highway law as special local conditions may make necessary. It also prohibits local authorities from making ordinances or regulations in any way conflicting with the act. It is specifically provided, however, that nothing in the law "shall impair the validity or effect of any ordinance regulating the speed of motor vehicles heretofore or hereafter made, adopted or prescribed by cities of the first class."

Section 30 provides penalties for violations of the law. The first offense is punishable by a fine of not over $10, the second offense by a fine of not less than $10 nor more than $25, or by imprisonment for not less than 2 nor more than 15 days. The third or any subsequent offense within one year is a misdeameanor and is punishable by a fine of not over $100 or by imprisonment for not more than six months, or by both. The law provides that all fines, penalties and forfeitures collected in a city, town or village shall be paid to the government of such city, town or village and credited to the general fund.

Section 31 provides that the regulations shall be printed in pamphlet form by the Secretary of State and a copy either mailed or given to each person, firm or corporation to which a motor vehicle license or a chauffeur's license has been issued during a period of one year from the time the act takes effect, and subsequently to each such person, firm or corporation to which a license has not previously been issued during the period mentioned.

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

JULY 14, 1917

ROAD MAINTENANCE BY PATROLMEN

The maintenance of practically six thousand miles of roads outside of cities and villages should yield valuable experience, and for that reason particular interest attaches to the conclusions reached by an official in direct charge of the work. Some very illuminating discussion of work of this kind is contained in the 1916 report of Deputy Commissioner Sarr of the New York Commission of Highways, a review of which is printed elsewhere in this number of "Good Roads."

Maintenance by the patrol system has been tried out quite extensively in this country on such types of roads as require constant attention and, so far as the records show, has proved satisfactory wherever properly organized forces have worked under intelligent supervision. Yet, as noted by Mr. Sarr, the efficiency of this method as compared with that of the gang system, so-called, has been questioned. In order to determine the comparative merits of the two methods, he tried both and has summed up the results by reporting that "while the gang would unquestionably perform more efficient work than the average patrolman, it was found that the greater efficiency was more than offset by the greater magnitude of the work required to be performed."

This is the result that might reasonably be expected. If merely the efficient performance of given work is all that is required, a gang working on a fairly large job will give, as a rule, better results than will an equal number of men working singly on proportionately smaller jobs. But in maintaining a road the end sought is something very different; it is the keeping of the road in good condition at all times at the minimum cost. There enters into the problem not only the efficient performance of work but the factor of service given by the road. If a road is allowed to deteriorate until it is in such condition that gangs can be used advantageously—in other words, until repair rather than maintenance is required—the road will not have been maintained efficiently no matter how great a degree of efficiency is attained in the performance of the repair work. And in the end the gang method will probably entail a greater actual outlay of money.

As pointed out in a preceding paragraph and as noted in the report, this applies to those roads that deteriorate rapidly under the traffic they are called upon to carry. Under the conditions existing in New York State, according to Mr. Sarr, it is "chiefly applicable to the water bound macadam and gravel surfaced highways which are subjected to any considerable amount of motor vehicle traffic and which deteriorate rapidly under such traffic, but with bituminous bound macadam, first-class concrete, and brick pavements, which do not deteriorate rapidly, it is questionable whether a gang patrol is not more efficient than the individual patrol."

A TRAFFIC COMMISSION FOR NEW YORK CITY

The appointment of a commission to study the problem of traffic congestion in New York City and the future development of the city's arteries of travel is noted elsewhere in this issue.

This step is one that has long been needed. Traffic is badly congested in parts of the city, especially at certain times of the day, and the city, as a whole, lacks main channels of communication. Much has been done to improve conditions by regulation, and more can be done, but the whole matter can be adjusted only by an intelligent, carefully developed plan involving many problems of engineering as well as of policing.

A commission is needed to coordinate the plans proposed by individuals and organizations that naturally view the problem from different angles. The engineering investigations and reports, it is stated, are to be handled by Nelson P. Lewis, Chief Engineer of the Board of Estimate and Apportionment, and the engineers of the several boroughs. Under the leadership of Mr. Lewis the engineering work will be well done and the present police officials—if consulted, as they presumably will be—can be relied upon to bring to the commission recommendations based on their experience in the excellent work they have already done. It is to be hoped that the personnel and the disposition of the commission will be such that the fullest advantage will be taken of the expert advice that can be had for the asking.

TRAFFIC LAWS AND ROAD DESIGN

Some weeks ago a new state law for the regulation of traffic went into effect in New York. A review of the law, in which some of the more important sections are given in full, appears on other pages of this issue.

Many excellent provisions are included in the measure, among them the rule that at any intersection where traffic is not controlled by a traffic officer a driver must grant the right of way to a vehicle approaching on his right. This rule has already been adopted in other places and is admirably suited to modern traffic, for it covers intersections of all kinds, is applicable to any number of vehicles and to all kinds of vehicles, and, last but by no means least, is easily remembered.

Despite the excellence of traffic laws, however, it must be remembered that rules and regulations alone are not sufficient to safeguard those who use the roads. It is impossible to make a careful driver by legislation and the best laws will not make safe a poorly located and badly designed road. It is in the latter that the engineer must do his part.

It is only within the past decade that safety has become one of the most important factors in road and street design. Before the coming of the motor-driven vehicle, traffic was seldom either fast or heavy and never both. Sharp turns, except in proximity to railroad grade crossings, were hardly to be regarded as dangerous, and steep grades were objectionable chiefly because of their resistance to traction. Under the traffic conditions now obtaining, on the other hand, both curves and grades must be so treated as to reduce to the minimum their possibilities of danger, and upon the skill with which they are handled largely depends the safety of all road users.

Plans for Camden-Philadelphia Bridge

The New Jersey Bridge & Tunnel Commission has had plans made for a suspension bridge over the Delaware River, to extend from Cooper St., in Camden, N. J., to Arch St., Philadelphia, Pa., a length of 1,745 ft., with a width of 114 ft. The estimated cost of the structure is $8,000,000. The plans were prepared by Waddell & Son, Engineers, of 165 Broadway, New York, N. Y.

Traffic Commission for New York City

The appointment of a commission to handle the problem of traffic congestion in New York City has been authorized by the Board of Estimate and Apportionment, acting upon the report of the board's committee on the city plan. The report was based on a consideration of petitions presented by a number of city associations, requesting that such a commission be appointed.

The questions with which the traffic commission will have to deal are the regulation of traffic and other means of providing greater capacity for existing streets, the separation of grades at important intersections, and the planning of a complete connecting system of automobile and trucking thoroughfares for all boroughs, and connecting routes between the city and bordering sections of New York and New Jersey.

The secretary of the Committee on the City Plan will serve as secretary of the traffic commission, and matters of engineering will be in charge of Nelson P. Lewis, Chief Engineer of the Board of Estimate. No appropriations will be made for carrying on the work of the traffic commission, the members of which are to serve without remuneration.

Robert H. Whitten is secretary of the Committee on the City Plan.

Reconstruction of the Galveston Causeway

Arrangements for starting the work of rehabilitating the portions of the reinforced concrete causeway over Galveston Bay, which were destroyed by the tropical storm of Aug. 16 and 17, 1915, are being made. The proposition of the Larkin & Sangster Co. to replace the approaches to the causeway with reinforced concrete construction and make the necessary repairs to the original permanent structure at a cost not to exceed $1,725,000, has been accepted by the railway and interurban interests and the Commissioners' Court of Galveston County. The causeway is used by all the railroads and interurban electric lines that enter Galveston and also by wagons, automobiles and other vehicles as a connection between Galveston Island and the mainland. Under the terms of the contract, the Larkin & Sangster Co. is to receive a profit of $130,000 and an allowance of $120,000 for liability insurance, overhead expenses and the cost of supervision. It is estimated that the materials and labor will cost approximately $1,300,000.

The Commissioners' Court of Galveston County has entered into a contract with the railway and interurban interests to bear any expense of the work in excess of $1,725,000. It is expected that it will require about two years to rebuild and repair the causeway. When completed it will have a length of about 2 mi., and it is thought that the solidity of its construction will assure it immunity from the disastrous storms that occasionally visit the coast region.

The plan for the arch type of construction was adopted for the approaches to the causeway, as noted in "Good Roads" for Jan. 20, 1917, page 43, and this type corresponds with the main causeway, which was also designed by William Mueser, of the Concrete Steel Engineering Co., of New York City.

The rebuilding of the structure has been under consideration since the storm destroyed portions of it, but the magnitude of the proposed work together with the desire on the part of all interests concerned to adopt the best possible plan for insuring the permanency of the causeway, has necessarily caused slow progress in the work of reconstruction. The increase in the price of materials was another factor that contributed to the delay. Immediately following the storm the railroads built a temporary trestle across the bay, which they have been using ever since. All vehicular traffic, however, has been suspended during this period.

Road Promotion in Kansas

An organized effort to educate the people of Kansas to the importance of scientific road building and to aid them in carrying out their own enterprises economically and successfully, is being made by the State Highway Commission and good roads associations. As a result of this preliminary work much interest is being manifested by farmers as well as other citizens throughout the state. Several counties have taken decisive steps toward securing improved roads, notable among them Brown County, in the northeastern part of the state, which recently voted to build an improved road across the county following the routes of the Pikes Peak Ocean to Ocean Highway, at an estimated cost of $20,000 per mi. Adjoining counties, it is stated, will follow the example of Brown County.

Enthusiasm is also shown in the matter of establishing special benefit districts in sections where good roads interests would be more speedily served by constructing highways through such means. The proposed highway from Kansas City to Topeka is gaining advocates daily; landowners along the proposed route, representing an ownership of many thousands of acres, have signed petitions for a brick road between the two cities. It is estimated that upward of 5,000 mi. of brick or other type of hard-surfaced roads will have been petitioned for before the end of the present year, with a favorable outlook of early construction.

According to the law passed at the last session of the Kansas Legislature, road districts may be formed upon petition of 51% of the owners representing 35% of the property benefited, or 51% of the land and 35% of the owners; or 60% of the land in the proposed special district. The cost of construction is paid by the district, townships, and the county in amounts equalling 25%, 25% and 50% thereof, respectively. A special tax is placed upon railroads in the district. In addition to federal aid and funds secured through donations and otherwise, the means authorized for raising revenue for road improvement is by the issuance of bonds for from five to ten years, at not more than 5% per annum.

Taking Ford County as an average example of municipality in its section of the state, where approximately $50,000 is expended annually for the maintenance and repair of earth roads and bridges, it is estimated that taking also into account the large sums expended annually for the upkeep of motor and other vehicles, a saving of many thousands of dollars a year would be effected by the construction of 150 mi. of permanent highways in the county.

Changes in the Illinois Road Laws

New laws that became effective on July 1 have abolished the State Highway Commission along with a large number of other commissions and boards that have heretofore had charge of various branches of state activity.

In place of these numerous administrative bodies there have been created less than a dozen departments, road work being placed under the general supervision of the Director of Public Works and Buildings. Under this officer, a superintendent of highways and a chief highway engineer will have direct charge of the work.

S. E. Bradt, formerly secretary of the State Highway Commission, has been appointed Superintendent of Highways.

The Selection of Gravel for Road Building[*]

Next to proper drainage, the most important thing in building gravel roads is to secure a good quality of gravel. The bank gravels of Michigan, being of glacial origin, vary widely in their character, both as to the kinds of rocks, of which the pebbles are rounded fragments, and the kinds of earth with which they are mixed. This variation is most marked when the gravels from different sections of the state are compared. The rims of limestone ledges that surround the northerly ends of Lakes Michigan and Huron and outcrop at intervals on the adjacent shores of both peninsulas have influenced the gravel in those parts and for some distance southward by contributing a large proportion of limestone pebbles. Farther south, and especially in the interior of the lower peninsula, the pebbles are found to contain a larger percentage of igneous rocks, such as granite and trap, also much quartzite. It is probable that these harder rocks came from the north of Lake Huron and that a considerable quantity of the softer pebbles were ground to powder in transit. The same variation, even to a greater extent, is apparent in the cobbles or field stones covering these areas.

Authorities have differed as to the requirements of suitable road gravels, most of them placing too much stress on the immediate packing qualities. Indeed, the average township commissioner and farmers generally have become so imbued with the idea that it is necessary to use a gravel that will pack quickly that they have almost lost sight of the fact that the only thing which makes a gravel road better than an earth road is the pebbles, real stones, that it contains and is dependent upon to bear up traffic and resist wear.

The most common material sought after for the binder in gravel roads is clay. But, considering all kinds of weather, it is probably the poorest cementing material we have. If present, much in excess of 10% of the mass, it will make mud whenever there is a prolonged wet spell, and especially when frost is coming out of the ground in the spring. Ideal clay gravels contain only enough clay to coat the pebbles, with no free lumps. Such gravels are excellent for the first layer on sandy soils, but sand gravels are much better for the first layer on clay and loamy soils.

Gravels that come from the pit with the pebbles cemented together, even though they contain no clay, will re-cement in the road and become harder than they were in the pit. Tests of specimens of this kind always show that there is much lime present and usually some iron, both of which are excellent cementing materials. Briefly, the experience of the State Highway Department warrants the statement that there are few, if any, bank gravels in Michigan that do not contain enough limestone and other soft pebbles which grind up under traffic to furnish sufficient binder to cause them to consolidate in a few months' time, if separated from the surplus sand and earth, and properly treated after applying to the road.

In accordance with these suggestions, gravels are considered valuable for road purposes, in the following order:

(1) Almost in direct proportion to the percentage of pebbles constituting the mass.

(2) In direct proportion to the value as road metal of the rock fragments constituting the pebbles.

(3) In direct proportion to the value as a cementing material, under all conditions of weather, of the finer particles of earthy matter constituting the filler or binder.

Conforming to these principles, the Michigan specifications require that at least 60%, a larger per cent if possible, by weight of the gravel shall be pebbles above ⅛-in. in size, with no pebbles in the bottom course that will not pass through a 2½-in. screen, and in the top course that will not pass through a 1½-in. screen, and that not more than 10% of the mass, much less if possible, shall be clay uniformly mixed and having no free lumps. For trunk line roads the gravel for the top course shall test 75% pebbles passing the 1½-in. screen and retained on the ⅛-in. screen.

A testing screen is easily made by tacking a piece of screen wire of ⅛-in. mesh to a little box 1 ft. square and 3 in. deep to form the bottom. To avoid figuring in percentages 5 lb. of pit-run gravel should be weighed out and screened. Three pounds of pebbles out of five would show 60% pebbles; 3½ lb., 70% pebbles; 4 lb., 80% pebbles, etc.

NEWS NOTES

The William Penn Highway through Pennsylvania has been shortened by 15 mi. by the acquisition of property along the Juniata River between Clarks Ferry and Newport. The new metal markers for the highway, as a portion of the Pikes Peak Ocean to Ocean Highway, have been received by the William Penn Highway Association and will be placed along the roadway as rapidly as possible.

An Appropriation of $200,000 by the Levy Court of New Castle County, Delaware, has been recommended in a report submitted to the court by County Engineer James Wilson. The money was recommended for use in the repair and maintenance of county roads during the present year. The increased traffic, the late winter and the heavy rains of the present season, according to Mr. Wilson, have combined to make the condition of the roads unusually bad.

The County Council of Marion County, Indiana, has made provisions for a $200,000 bond issue to raise funds for improving the road to Ft. Benjamin Harrison. According to reports the money will be used to build a brick road from Millersville to the reservation and to repair other roads. The reservation is used as a training camp for recruits, especially for the medical corps, and there has been much inconvenience caused by the condition of the road leading to it.

Commissioner of Public Works F. G. Simmons, of Milwaukee, Wis., has warned contractors doing street work that jobs must not be commenced unless there is certainty of completing them within a reasonable time, according to reports. It is stated that inability to obtain sufficient labor is causing delay in street work in the city, and that Commissioner Simmons has announced that unless contractors perform their work more expeditiously he will be obliged to enforce the forfeiture clauses in the contracts.

The Scenic Highway from Cody, Wyo., to Yellowstone National Park has been put in condition for travel and is again open to the public. Automobile stages which have replaced the old stage coaches used for transporting tourists over the road for so many years started this week on a regular schedule and will continue during the season. The clearing of the highway has been a difficult task due to the unusually large amount of snow which covered it during the winter. The route is through Shoshone Canyon and over Sylvan Pass, entering the park at its eastern boundary.

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[*] From "Gravel Roads," Bulletin No. 2 of the Michigan State Highway Department, by Frank F. Rogers, State Highway Commissioner of Michigan.

LETTER TO THE EDITOR

Military Road Building in France

Editor, "Good Roads:"

We believe you will be interested in the enclosed copy of letter from Lt. Col. W. G. Mackendrick, President of the Warren Bituminous Paving Co., Ltd., of Ontario, addressed to Mr. George C. Warren, President of Warren Brothers Company. Col. Mackendrick has been abroad about two years connected with military road construction at the front in France and Belgium. He went abroad privately as a civilian, tendered his services to the British Government and was first commissioned Captain in charge of a detachment of Canadian volunteers; was later advanced to Major and recently to Lieutenant-Colonel.

Very truly yours,
WARREN BROTHERS COMPANY.

Boston, Mass.

[Parts of Col. Mackendrick's letter, referring particularly to road work, are printed below. His promotion to his present rank was noted in "Good Roads" for June 23.—Ed.]

"All the roads in France and Belgium are macadam or macadam with stone setts on sand in the center of the road except in the towns and villages where the main streets are mostly stone setts or 'pavic' as they call them here. Nearly all French roads are of very light construction—from 4 to 6 in. of gravel or stone and a few inches of chalk or sand. They do not stand up under the intensive traffic of the 3- and 5-ton lorries, guns, etc., in the army areas, and in the spring, fall and winter it is a case of strengthening them with macadam, slag, mine refuse, chalk, old soft bricks from the destroyed villages, or anything that can be had. In bad places where it is wet and swampy we use sleeper roadways, i. e., railway ties on three bearers spiked down on 3-in. plank roads or three bearers of corduroy roads similarly built.

"When building roads in France or Belgium we used to adopt McAdam's method of standing large stones on end, hand placed, and then breaking off the tops and placing macadam on top and rolling, but I found that in this climate and on wet soil this method was very expensive, as the huge lorries drove the stones down into the mud and they kept on sinking. So I adopted the method of laying the large stones—the soling as they call it here—on the flat side to give better bearing so it would carry the lorries better and then filling macadam on top of this in dry weather, rolling and consolidating as usual, and binding with mud from the side of the road in wet weather, first placing the soling with more on top, and letting the traffic wiggle it into shape No rollers are used in winter, as they block traffic too much and are unnecessary.

"The road from Albert to Bapaume was rebuilt and recoated in this way and we carried all the army on it without a roller on the road until the dry weather of May, when we started to put a regular coating of macadam on it and had eight rollers working two shifts per day licking it into shape.

"Time is the factor in all advance road work such as is only possible in these armies, for from the minute an advance is made by the infantry the guns must go up in support and the munitions must go up constantly thereafter, and whatever can be got to make the roads usable is the thing for the army. We carried all the roads in the recent advance for many weeks with repairs made to all the shelled sections, which in the worst spots comprised from 80 to 90% of the road near and in villages, with the bricks and building chalk from the destroyed buildings in the nearest village. The traffic ground this material into powder and in wet weather into mud, and it had to be renewed every day or two. But with stone costing 30 shillings a ton—and not available at any price—we had to use what we could get. We have built many miles of railway sleeper roads for temporary use.

"Cost never enters into the question here when we are moving; whatever we can get that will hold up the guns and traffic is used. Trees are used. Old sleepers, rafters, etc., from houses in the demolished villages are laid down to enable the guns and regiments to get along and keep moving. In many cases we could make roads only good enough for the horses to pull in the ambulance carts, and limbers could not be taken in over the only available roads until many days' or weeks' work had been put on them. I have had 10,000 to 12,000 men working for many months and have used up to 2,000 tons of material a day, not counting corduroy, sleepers or pit props or brick. When possible we fill all holes with broken bricks and put from 4- to 6-in. macadam on top for a wearing surface, and all the while we must keep the traffic moving, usually two ways, on roads 16 to 18 ft. wide.

"I suppose my office will have advised you that I have been promoted to rank of lieutenant colonel and made Assistant Director of Roads instead of Deputy Assistant, as my chief, Brig. Gen Maybury, who was Chief Engineer of the English Road Board in civil life, has been promoted from Deputy Director to Director, and his assistants, one for each army on the British front, have been made assistants. I was also mentioned in dispatches by Sir Douglas Haig, Commander in Chief of the British forces. I still wear the same sized hat though, but have acquired a record for being the most profane officer in the 5th Army H. Q. and all I say is 'Damn it.'

"If you are successful with the offers you made to your government to place your organization at their disposal you had better select the most adaptable men you have in charge as that is what counts in this slap-dash method of building roads, though the French are now in need of men away behind to keep up their main routes of macadam. This is required behind all the armies in France. Boche prisoners are now utilized for this work. I had 2,500 up to a week ago when I moved.

"I had a close call yesterday. I thought the tire of my Daimler limousine had exploded but found it was a shell that had hit the road 25 ft. behind, and another took the telephone wires down in front of me, so I'm touching wood for the third time. The Huns are plastering all the roads we are working on and I'm thankful every day I get home with a whole hide and that I'm alive."

Yours sincerely,
W. G. MACKENDRICK.

Somewhere in France,
June 5, 1917.

Plans for a Military Highway Between Chicago and Waukegan, Ill., call for brick paving on concrete foundation, width of pavement to be 24 ft. It is reported that the road will be practically new for the greater part of the distance between Evanston and Fort Sheridan, and it is estimated that the cost of its construction from Highland Park to Waukegan will amount to at least $250,000.

MEETINGS

Calendar of Coming Meetings

July 26-27.—League of Michigan Municipalities.—Annual convention, Grand Rapids, Mich. Secretary, Charles A. Sink, Ann Arbor, Mich.

August 15-17.—League of Wisconsin Municipalities.—Annual convention, Racine, Wis. Secretary, Ford W. MacGregor, Madison, Wis.

August 22.—Union of New Brunswick Municipalities.—Annual convention, St. John, N. B. Secretary, James King Kelley, St. John, N. B.

August 27-29.—Union of Canadian Municipalities.—Annual convention, London, Ont. Secretary, W. D. Lighthall, K.C., Westmount, P. Q.

American Society of Municipal Improvements

It has been decided to postpone the annual convention of the American Society of Municipal Improvements, which was scheduled for November 12 to 16, at New Orleans, La., for about one year. The decision was reached at a recent meeting of the executive committee, and resulted, it is stated, from the fact that a large number of members have enlisted for military service, and it was believed that because of municipal responsibilities placed upon those remaining a successful attendance at the November meeting could not be secured.

The annual convention of County Road Supervisors of New Jersey was held at Atlantic City, June 30. Speeches on road topics were made by Commissioners John W. Herbert and Walter J. Buzby, and State Highway Engineer R. A. Meeker. A number of counties were represented at the meeting.

PERSONAL NOTES

W. H. Swartz has been appointed City Engineer of Vancouver, Wash.

J. T. Bartrug has been appointed Engineer of Highways of Lincoln County, West Virginia.

A. S. Adams has resigned as City Engineer of Bryan, Texas, and, it is reported, will join the Engineers' Reserve Corps.

J. M. Lowe, President of the National Old Trails Road Association for the past five years, has retired from that office.

C. F. D. Henry has been made City Engineer of South Bend, Wash. Mr. Henry has been County Engineer of Pacific County.

C. A. Hogentogler, of the University of Iowa, will have charge of road work in Columbia, Pa., during a year's leave of absence from the university.

William Wipperman, of the Agricultural and Mechanical College of Texas, has been appointed City Manager of Bryan, Texas, succeeding to the duties of City Engineer, an office made vacant by the resignation of A. S. Adams.

William M. Kinney, Engineer of the Promotion Bureau and Inspecting Engineer of the Inspection Bureau of the Universal Portland Cement Co., has been elected a member of the executive committee of the American Society for Testing Materials.

Ben Lee has been made City Engineer of Hutchinson, Kan., taking the place of G. L. McLane, resigned.

D. E. Colp, of San Antonio, Texas, has been appointed Secretary of the State Highway Commission of Texas. Mr. Colp was formerly Secretary of the Texas Good Roads Association.

D. A. Hartwell who, as City Engineer and in other departments has been connected with the municipal work of Fitchburg, Mass., for a number of years, has left the service of the city.

T. F. Hensley has been made Manager of the Bureau of Publicity of the Oklahoma State Department of Highways. He is a member of the state legislature and a newspaper man of long experience.

J. B. Mabry, of San Antonio, has been appointed Secretary of the Texas Good Roads Association and of the Bexar County Highway League. He has been associated with these organizations as assistant secretary for about two years.

M. A. Berns, Publicity Representative of the Universal Portland Cement Co., Chicago, Ill., has been commissioned a captain in the Engineers' Section of the Officers' Reserve Corps, and expects soon to be ordered to the second training camp. Mr. Berns is a civil engineering graduate of the University of Illinois.

NEWS NOTES

A Bond Election in Houston Heights, Tex., has been called for July 28, to vote on an issue of $150,000 for street improvements.

Bond Issues in Cass County, Texas, were voted on June 21 as follows: Road District No. 1, $40,000; Road District No. 4, $8,000.

A Contract for Street Paving in Buhl, Minn., recently awarded to Lawrence McCann, of Eveleth, Minn., calls for 12,000 sq. yd. of bitulithic construction.

The County Court of Douglas County, Oregon, will open bids at Roseburg on July 28 for the sale of road bonds in the sum of $555,000, according to report.

The Cost of Road Work in Marin County, California, during the present summer will approximate $237,000 according to report. This will include all state highway construction.

The Illinois State Senate has passed a bill obliging every wilfully idle man between the years of sixteen and sixty to work thirty-six hours a week on the highways of the state during the period of the war.

Road Bond Issues for Counties in Texas have been approved by the State Attorney General as follows: Brazoria County, Road District No. 10, $20,000; Milam County, Road District No. 11, $20,000; Bandera County, Road District No. 1, $22,000.

A Contract for Paving North Beacon and Other Streets in Brighton was recently awarded by the Mayor of Boston, Mass., to Coleman Brothers. The amount of the contract is $74,063.25. The type of pavement is to be 3-in. standard sheet asphalt. The time limit of the contract is Nov. 15; for every day additional a penalty of $100 is levied in the form of liquidated damages.

The County Highway Commissioners of Northern Minnesota recently conferred with officials of the Great Northern Railroad relative to the need of facilities for transporting road building materials for use on a number of main highways and side roads. C. M. King, Commissioner of Itasca County, at a luncheon speech following the conference said that the nation was turning to Minnesota for food, but that it could not do its share toward feeding the world without railroads and improved highways.

EQUIPMENT — TRADE — MATERIALS

Apparatus for Gauging Pavements

An apparatus for gauging the subgrades, foundations or wearing surfaces of pavements is shown in operation in the accompanying illustration.

The machine consists essentially of a template which is supported on the curbs and can be moved along the pavement by means of cables wound on the propelling mechanism at the center. The template is in two pieces each extending over half the pavement, and is furnished in any length desired. The lower edge, which is cut to fit the contour of the pavement, is shod with steel and is braced by steel rods at the sides to insure rigidity. Extension plates are provided at the ends for adjusting the machine to varying pavement widths. These permit an extension of 2 ft. at each end, or a total of 4 ft. without changing templates. When a greater range is required extra templates are used.

At the end of the extension plate at each end is a frame carrying two small wheels on which the gauge rolls along the curb. There is also a hand-wheel adjustment by which the gauge can be raised any desired distance up to 18 in. There is also a center adjustment for varying the crown, and a lever at the center by which the whole gauge can be lifted up from the pavement. By means of this the gauge can be lifted ¼, ⅜, ½, ¾ or 1 in., above the grade for which it is set, the lever being automatically locked at each position.

The propelling mechanism consists of chain driven drums operated by a crank, on which are wound cables running to the ends of the gauge and thence to anchorages in front of and behind the machine. There are two gears, one capable of moving the gauge along the street at a rate of 6 ft. per minute and the other at 21 ft. per minute.

An attachment for troweling concrete is also provided with the gauge. This is operated by a small gear driven from the propelling crank and can be thrown out of gear and drawn up out of the way when not in use.

Among the advantages claimed for the machine are that it saves labor, insures accurate work, avoids the use of unnecessary material and does work superior to that done by hand. It is known as the Roughen adjustable paving gauge and is manufactured by the Roughen Adjustable Paving Gauge Co., of Fond du Lac, Wis.

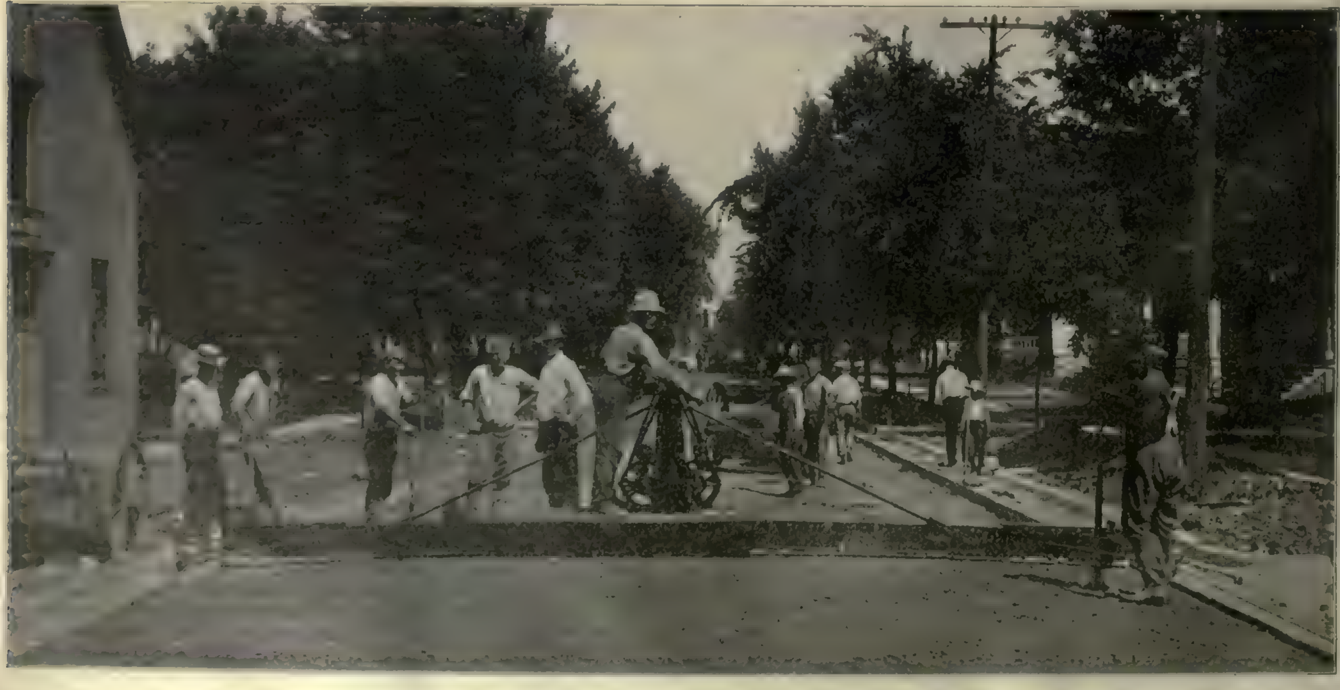
The Sullivan Machinery Co. of Chicago Ill., has announced the removal of its San Francisco office from 582 Market St. to 461 Market St.

The Medora Shale Brick Co., of Medora, Ind., of which N. V. Trautman is president, has been licensed by the Dunn Wire-Cut Lug Brick Co., of Conneaut, O., as a manufacturer of Dunn wire-cut lug brick. The addition of the Medora Company gives the Dunn Company 46 licensees, operating 71 plants in 12 states.

The Koehring Machine Co., of Milwaukee, Wis., has recently issued a circular calling attention to the avoidance of shipping difficulties by the maintenance of warehouses. It is announced that stocks of Koehring and "Dandie" mixers will be carried in the company's eastern warehouse and that orders from the eastern territory will be filled from that warehouse. On the other hand, the company urges that this fact be not permitted to encourage delaying the sending in of orders, as it is impossbile to so anticipate the demand for certain sizes as to fill all orders from warehouse stock.

The Asheville-Hendersonville Road in North Carolina is now under construction and an effort will be made to complete the work by Nov. 1. The road is to be of concrete, and will be built in one-mile sections.

The Authorities of Clay County, Indiana, have appropriated about $50,000 for the rebuilding and repair of bridges that have been destroyed or damaged by storms. About half of the appropriation will be used to replace the Great Brunswick Bridge across the Eel River.



ROUGHEN ADJUSTABLE PAVING GAUGE IN OPERATION.

GOOD ROADS

A Weekly Journal of Road and Street Engineering and Contracting

Old Series, Vol. LII.
New Series, Vol. XIV.

NEW YORK, JULY 21, 1917

Number
3

Military Road Building in Pennsylvania

The schedule for the road building project at the military camp at Mount Gretna, Pa., noted in the issue of June 30, as arranged by the officials of the State Highway Department, called for the completion of 2 mi. of water bound macadam road, 16 ft. wide, each week, beginning July 1, until the 6½ mi. required by the military authorities were completed.

Immediately upon the request of the Adjutant General to prepare the roads for the mobilization of the cavalry, artillery and heavy supply trains, the department began to assemble its forces and equipment, so that the work was started ahead of the schedule by George H. Biles, Second Deputy Highway Commissioner, who has charge of the construction. After the grading was done, five days of almost continuous rain transformed the roads into what was characterized by the department as "seas of mud."

LEFT TO RIGHT: DEPUTY STATE HIGHWAY COMMISSIONER BILES, CHIEF ENGINEER UHLER AND MAJ. SCHELL AT THE MT. GRETNA CAMP.

At present there are 300 laborers living under tents erected according to military regulations. Their meals are supplied by the National Guard Commissary Department.

The State Highway Department's equipment on the ground at present includes 12 traction engines, 10 rollers, 13 scrapers, 31 dump wagons, 22 motor trucks, 7 rooter plows, 9 sprinklers, 1 scarifier, 4 harrows, 4 drag scoops and 1 gasoline pump.

Twenty carloads of material are arriving at the scene of work every day and all of the equipment is kept busy distributing it to the proper points.

Delay at the commencement of operations in securing the required quantity of slag, resulted in the State Highway Department's practically commandeering the slag pile at Lebanon, and department men were put to work loading cars. Former efforts to blast the crust of the slag with dynamite were

CAMP SITE AND COMMISSARY OF THE PENNSYLVANIA STATE HIGHWAY DEPARTMENT AT MT. GRETNA, PA.

CLEARING RIGHT OF WAY FOR ROAD AT THE MT. GRETNA MILITARY CAMP.

PREPARING THE SUBGRADE FOR ONE OF THE MT. GRETNA CAMP ROADS.

abandoned, as the dynamite spread its force through the loose slag underneath the crust. A well-drilling outfit was put in and, after drilling holes through the hardened crust and the loosened slag, the mass was broken up with black powder.

The methods in use in the hurried road construction at Mount Gretna are described by Mr. Biles in the following manner:

"The work embodies principally the complete opening up of new right of way, which requires that various operations must be carried on in order, namely, the section first must be brushed, trees removed, and stumps and rocks blasted out before the actual grading work can be taken up. Upon some of the sections this work is of magnitude and requires a large organization to accomplish satisfactory results. When the right of way has been thus cleared, traction engines, with rooter plows, are started in to completely loosen up the surface. This is followed by traction engines and road machines, or graders, which complete the removal of the necessary material to the grade lines.

"All craters left by the removal of stumps and large rocks are filled with stone in order to insure a solid subgrade. Drains and culverts are then placed at the proper locations and after this the large power rollers are put in operation and the surface is thoroughly compacted. Upon the subbase, after being properly prepared, the slag, which is being used for the base construction, is deposited in the center of the road, in continuous stretches. This material is spread in two layers by these machines, which are drawn by traction engines, each layer being thoroughly rolled, and upon completion being about 8 in. in depth.

"With the final rolling of the slag base, the surface of the slag is sprinkled, which tends to solidify or cement the material more uniformly. Upon this surface is deposited in continuous piles along the center of the road, the same as was done with the slag, trap rock ballast. This is also spread in place with the use of the traction engines and road machines to a depth of about 5 in.

"When the proper amount of material is secured and the spreading is completed, a spiked-tooth harrow, weighing about 400 lb., is drawn over the surface of the road, back and forth, which segregates the stone and eliminates the possibility of loose pockets. This operation is continued until

(*Concluded on page 36*)

HEAVY STONE BASE READY FOR ROLLING—MILITARY CAMP SITE AT MT. GRETNA, PA.

EXCAVATION FOR A CONCRETE CULVERT ON A ROAD AT THE MT. GRETNA CAMP.

Standards of the Kentucky Department of Public Roads for Concrete and Steel Highway Bridges

By RODMAN WILEY* and CHAS. D. SNEAD†

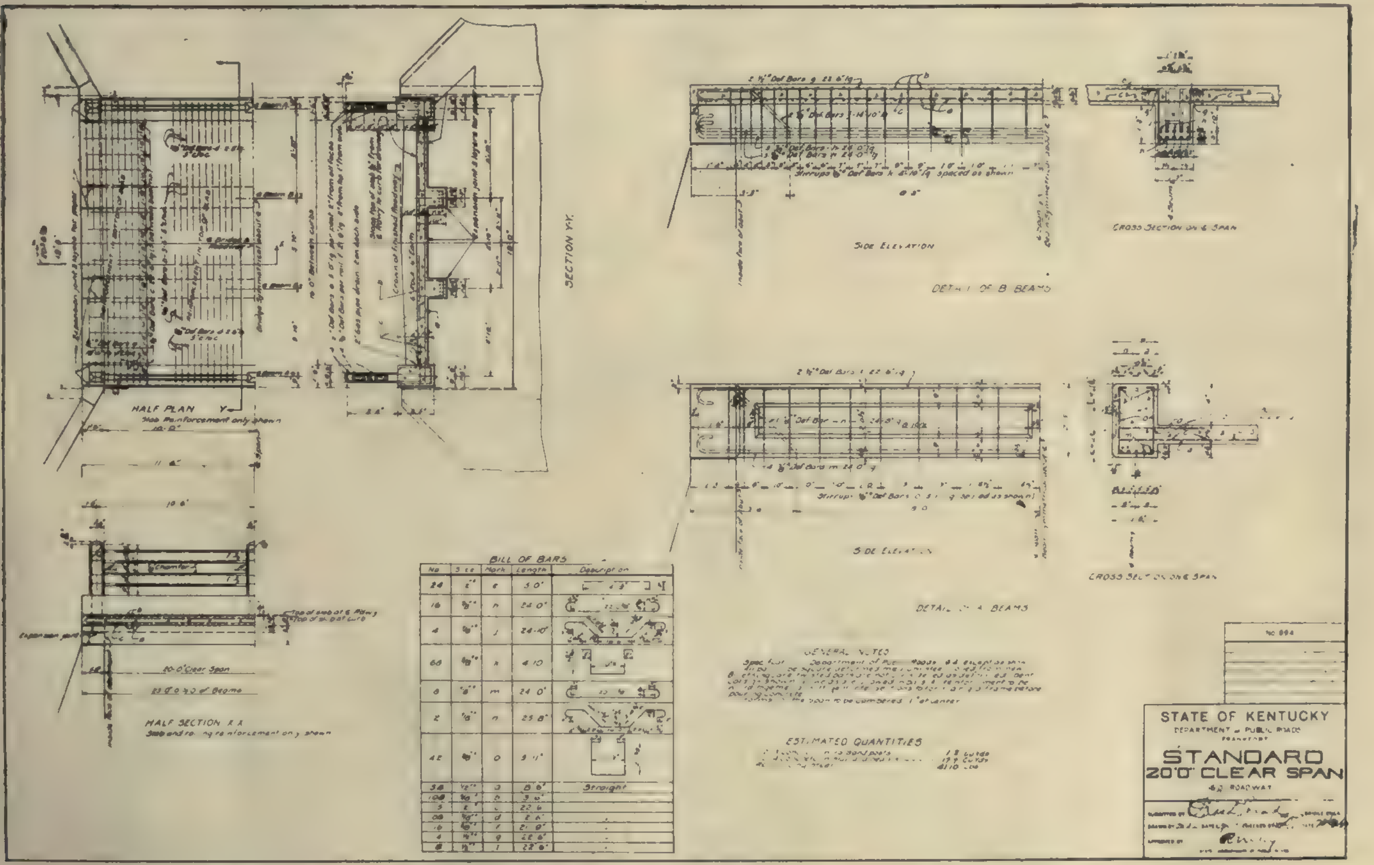
When the Department of Public Roads of Kentucky was established in 1912, the officials were clothed only with advisory authority. The law, however, specified that the department should prepare plans for all drainage structures costing over $500, the various counties to advertise for bids on said plans. But it was not compulsory that the bridges be built on plans and specifications of the highway department.

In order to comply with the law, county officials requested the office to furnish a great many bridge plans and owing to the limited appropriation for the maintenance of the office and consequently the small office force, no attempt was made to send out any other than line drawings. No sizes of any members were noted except the floor system, and the bridge companies were supposed to design the structures from the specifications which accompanied all plans. It is needless to say that bridge companies were not eager to bid on plans where so little information was furnished, and no end of trouble was experienced.

When the state aid law was put into effect in 1915, it was necessary for the department to prepare plans, as all structures had to be built under its direction. Owing to the fact that so much work had to be gotten out in such short time the plans could not be made as complete as they should have been; but for all concrete work detail plans were prepared and for steel bridges the sizes of all members were indicated as well as a stress diagram and a few details such as the floor system, etc. That proved, of course, a great deal more satisfactory to bridge companies than line drawings, but at the present time we have prepared complete designs, several of which are shown in the accompanying illustrations.

The tremendous increase in the use of heavy agricultural machinery, automobile trucks and rollers, together with the numerous bond issues for the improvement of roads, tends to eliminate the possible designation of roads as "main roads" and "secondary roads" when applied to the capacity of a well designed and properly maintained bridge. For such reason, the Department of Public Roads has deemed it advisable to design no bridges with a capacity of less than one 15-ton tractor.

With the improvement of roads, there has resulted an enormous increase in both horse-drawn and motor-propelled vehicles. Single track roadway bridges are no longer adequate to accommodate the new traffic conditions thus brought about. No width of roadway less than 16 ft. is employed. This width is measured in the clear, between hand rails on the steel structures and between curbs on the concrete structures.



KENTUCKY DEPARTMENT OF PUBLIC ROADS—STANDARD DESIGN—20-FT. CONCRETE BRIDGE.

Standard designs have been prepared for the following types of structures:

Concrete Spans

Openings from 3 sq. ft. to 24 sq. ft., inclusive, concrete box culverts.

Spans from 2 ft. in the clear to 20 ft. in the clear, inclusive, reinforced concrete flat slabs.

Spans from 16 ft. in the clear to 30 ft. in the clear, inclusive, reinforced T-beam spans.

Spans from 32 ft. in the clear to 42 ft. in the clear, inclusive, reinforced concrete through girder spans.

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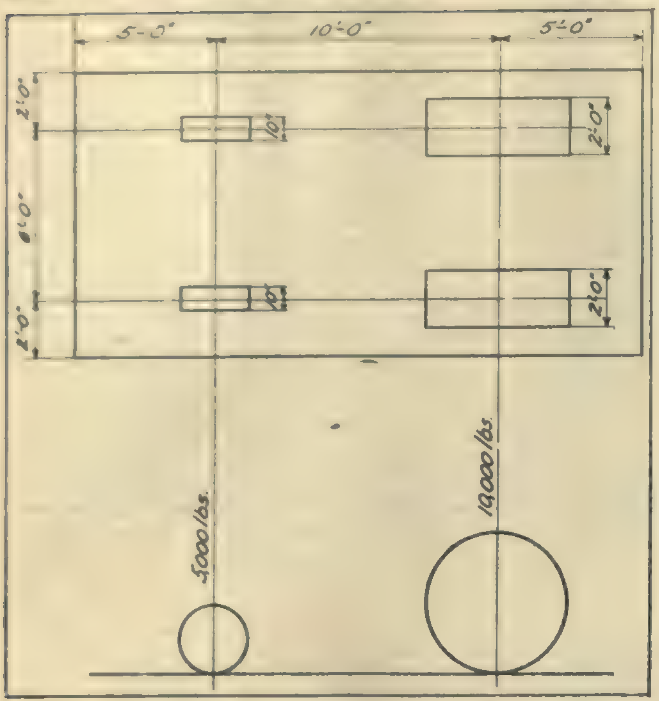
*Commissioner of Public Roads of Kentucky.

†Bridge Engineer, Kentucky Department of Public Roads.



SKETCH SHOWING DISTRIBUTION OF TRACTOR LOAD—KENTUCKY STANDARDS.

Steel Spans

Spans from 40 ft. c. c. bearing to 80 ft. c. c. bearing, inclusive, low riveted trusses.

Spans from 85 ft. c. c. bearing to 130 ft. c. c. bearing, inclusive, through riveted trusses.

Spans from 135 ft. c. c. bearing to 175 ft. c. c. bearing, inclusive, through pin connected trusses.

Alternate plans are being prepared for spans of 130 to 150 ft., inclusive, with riveted connections. No attempt has been made as yet to issue standard plans for arches which are recommended wherever foundation conditions justify.

Concrete Standards

It has been the attempt of the department in designing its standard for concrete bridges to employ designs which can be easily and readily cast in the field and which will insure a pleasing appearance with the most economical forming. All concrete bridges, in addition to their own dead weight, have been designed for a covering weighing 120 lb. per sq. ft. of roadway and for a live load of either one 15-ton tractor or a uniform load of 100 lb. per sq. ft. The live load above noted is increased by 25% for impact. The distribution of the tractor load is as shown in the accompanying sketch.

Steel Standards

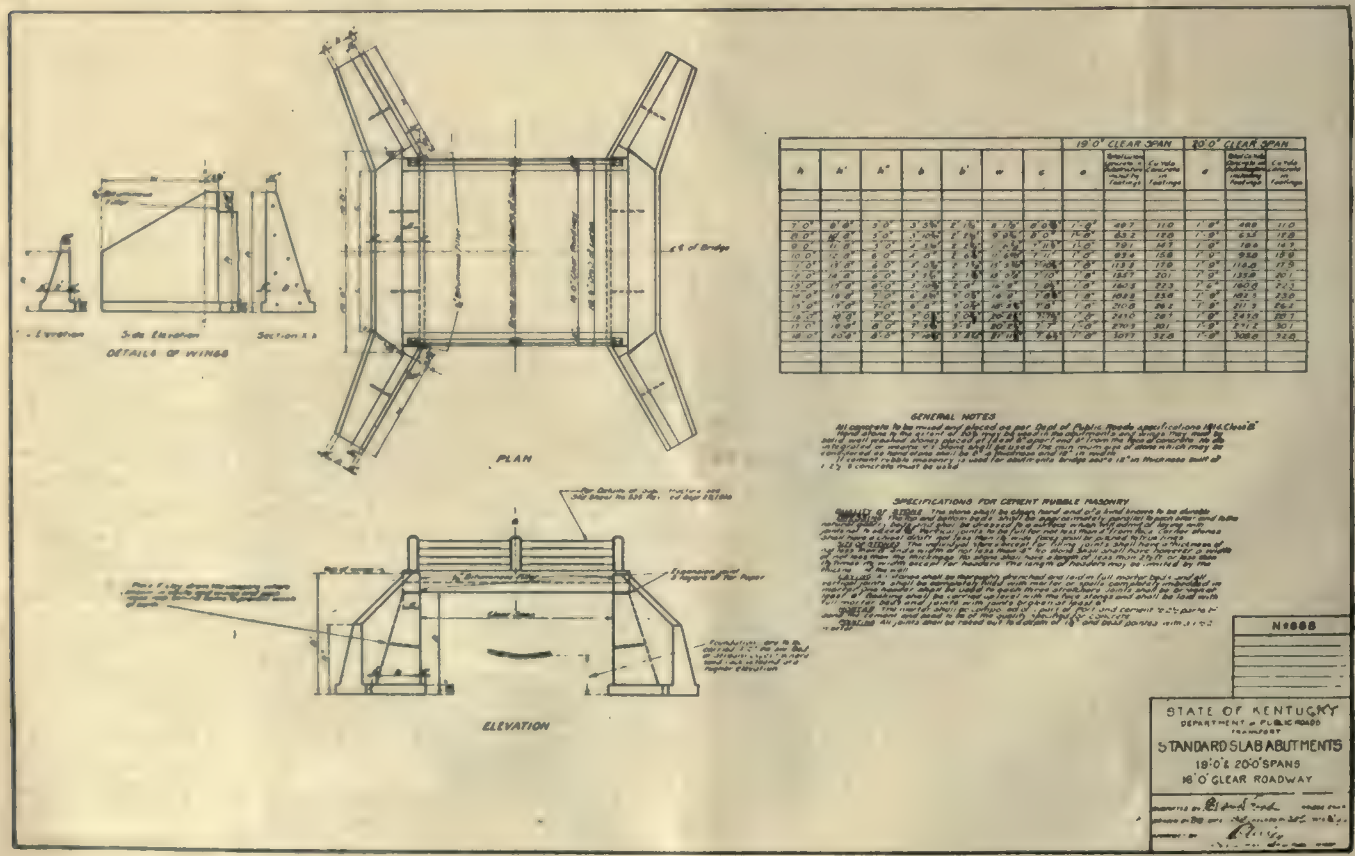
In the design of steel standards no attempt was made to design the spans for concrete floor alone. It was endeavored, however, to design the structures at present for a satisfactory type of wooden floor and yet strong enough to allow, at some future time, the employment of a floor of reinforced concrete. Counters have been provided in all designs for the lighter floor.

It has been the endeavor of the department to comprise the following in each design:

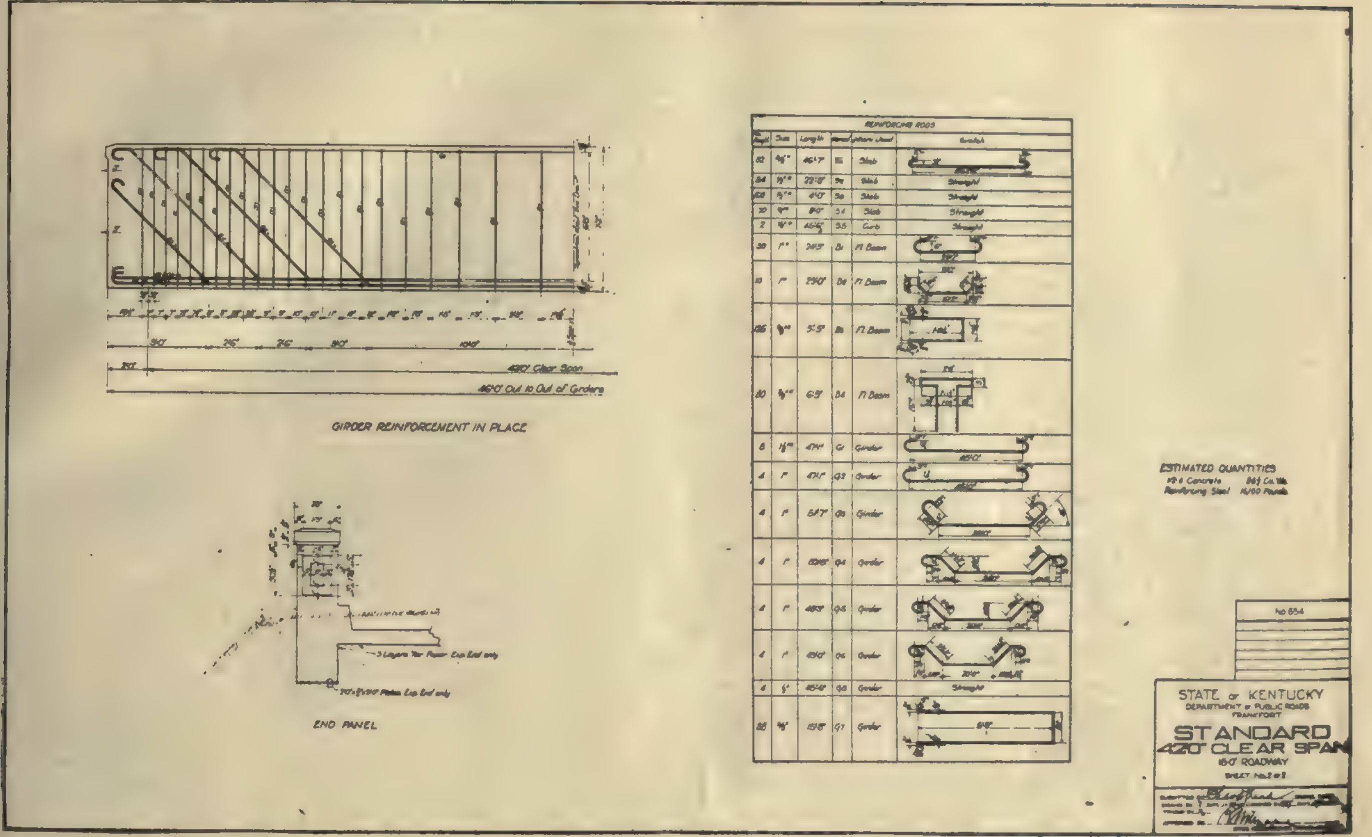
First, to provide for the increased dead load of a better type of flooring.

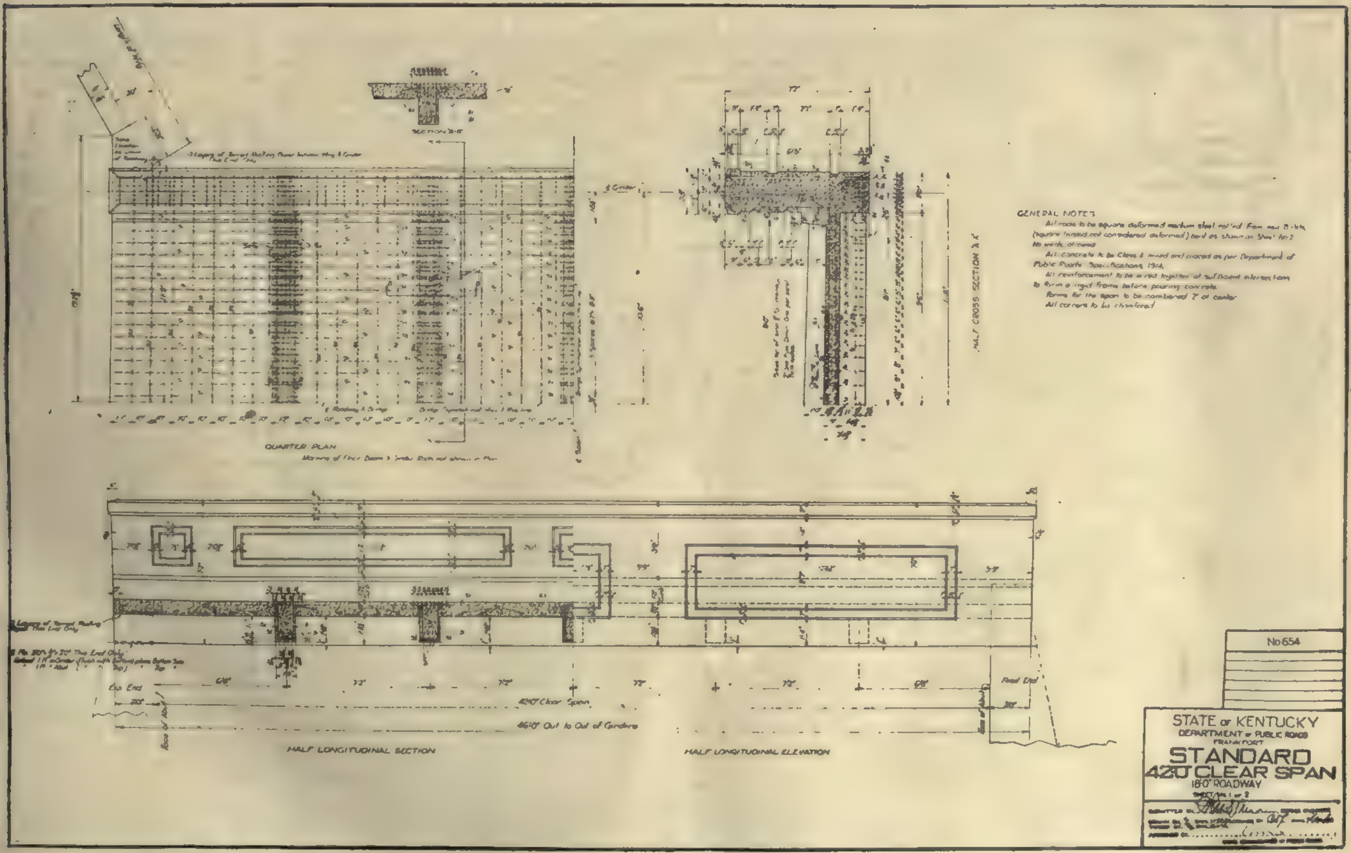
Second, to allow shipment of the trusses in sections to the field and eliminate as many field rivets as possible. Further, to arrange the field rivets to be driven to the best advantage in the field.

Third, to provide splices in tension members capable of developing the full capacity of the member and in compression members to develop at least 75% of the value of the



KENTUCKY DEPARTMENT OF PUBLIC ROADS—STANDARD DESIGN—19-FT. AND 20-FT. SPAN, SLAB ABUTMENTS.



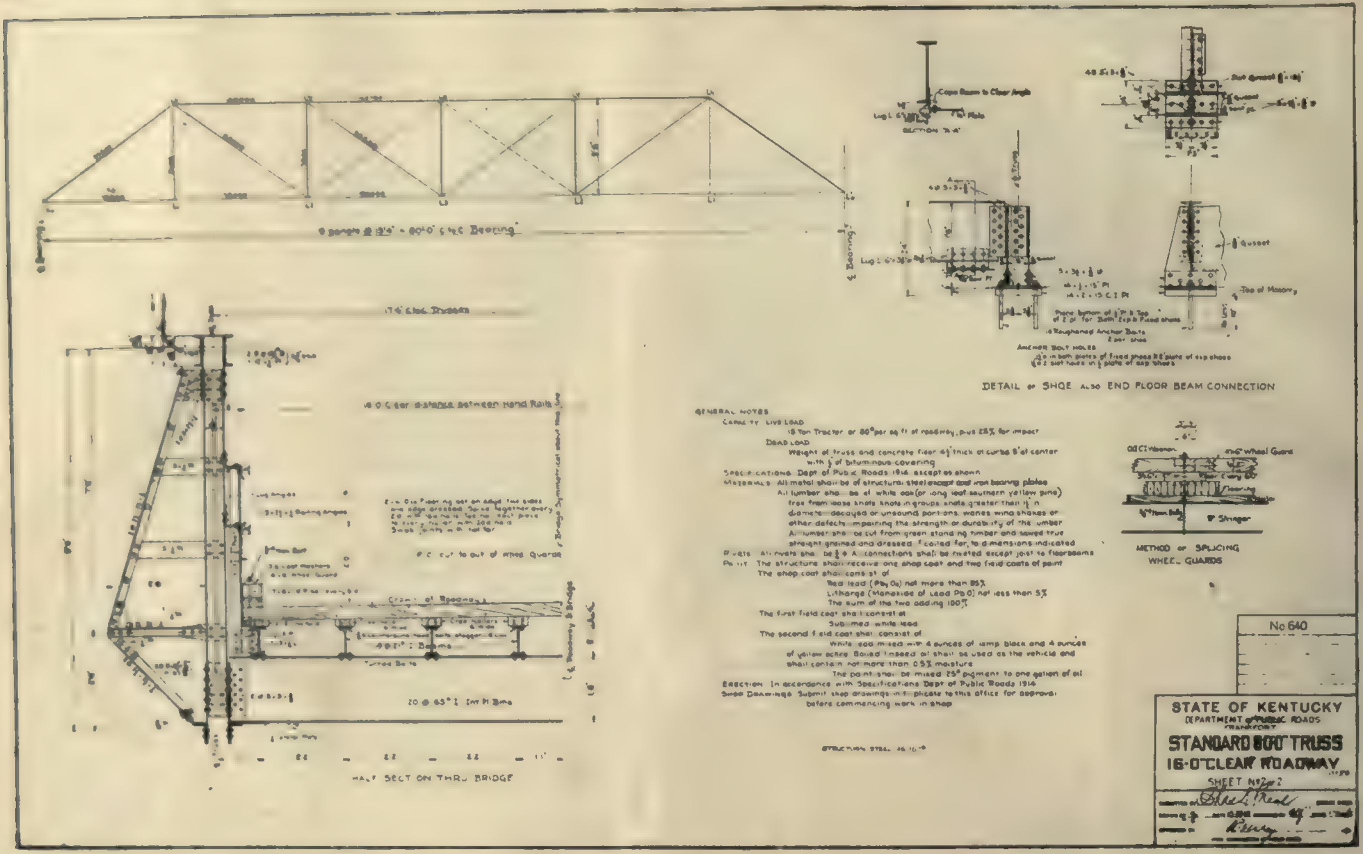


KENTUCKY DEPARTMENT OF PUBLIC ROADS—STANDARD DESIGN—42-FT. CONCRETE GIRDER.

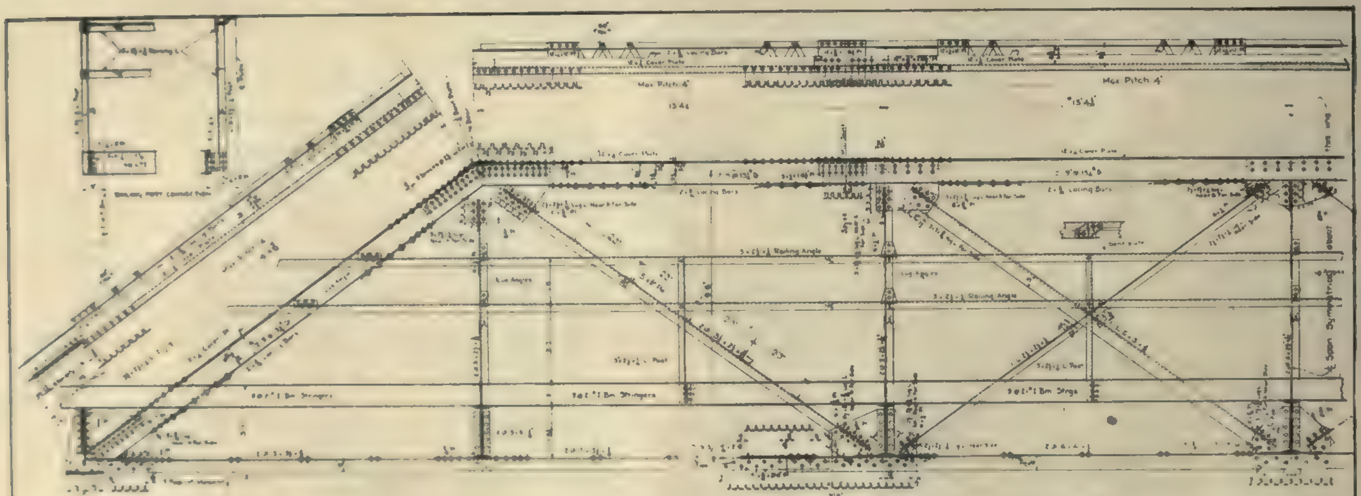
member (this in addition to milled joints which in many cases have not proven satisfactory).

Fourth, to permit free air circulation and surfaces easily accessible for painting.

Fifth, to show in detail the required rivet spacings and the desired details of all members. This eliminates any uncertainty by the bridge companies in bidding and unnecessary changes and delays prior to final approval of shop drawings.


5 panels @ 16'0" = 80'0" c to c Bearing
DETAIL of SHOE also END FLOOR BEAM CONNECTION
METHOD of SPLICING WHEEL GUARDS
HALF SECTION THRU BRIDGE
16'0" Clear distance between Hand Rails
Crown of Roadway
No 640
STATE OF KENTUCKY
DEPARTMENT of PUBLIC ROADS
FRANKFORT
STANDARD 80'0" TRUSS
16'0" CLEAR ROADWAY
SHEET No 2 of 2

GENERAL NOTES
Capacity Live Load
15 Ton Tractor or 80# per sq ft of roadway, plus 25% for impact
Dead Load
Weight of truss and concrete floor 4½" thick at curbs 5" at center with ½" of bituminous covering
Specifications Dept of Public Roads 1914 except as shown
Materials All metal shall be of structural steel except cast iron bearing plates
All lumber shall be of white oak (or long leaf southern yellow pine) free from loose knots, knots in groups, knots greater than 1½" in diameter, decayed or unsound portions, wanes, wind shakes or other defects impairing the strength or durability of the lumber. All lumber shall be cut from green standing timber and sawed true, straight grained and dressed if called for, to dimensions indicated
Rivets All rivets shall be ¾" ϕ. All connections shall be riveted except joist to floorbeams
Paint The structure shall receive one shop coat and two field coats of paint
The shop coat shall consist of
Red lead (Pb_3O_4) not more than 95%
Litharge (Monoxide of Lead PbO) not less than 5%
The sum of the two adding 100%
The first field coat shall consist of
Sublimed white lead
The second field coat shall consist of
White lead mixed with 4 ounces of lamp black and 4 ounces of yellow ochre. Boiled linseed oil shall be used as the vehicle and shall contain not more than 0.5% moisture
The paint shall be mixed 25# pigment to one gallon of oil
Erection In accordance with Specifications Dept of Public Roads 1914
Shop Drawings Submit shop drawings in triplicate to this office for approval before commencing work in shop



KENTUCKY DEPARTMENT OF PUBLIC ROADS—STANDARD DESIGN—80-FT. STEEL TRUSS.

Sixth, to eliminate where feasible, all secondary stresses. Either the uniform live load or the 15-ton tractor governed the design of the steel standards, as in the case of the concrete standards. The uniform live load employed, however, in the design of the steel spans was 80 lb. per sq. ft. of roadway for all spans up to and including the 100-ft. span and reduced thence 2 lb. for every additional 10 ft. of length until

(Concluded on page 36)

Tests of Concrete Slabs to Determine the Effect of Removing Excess Water Used in Mixing*

By A. N. JOHNSON†

The importance of proper water content for concrete is generally recognized. The amount of water producing a maximum strength makes such a stiff mixture that it is impracticable in most concrete road work. It is necessary, therefore, to use a certain excess of water above that which will give the greatest strength.

In concrete road work, owing to the method of handling, it is of considerable convenience to use a fairly wet mixture. It has been found, however, that much of the excess water can be removed by proper manipulation of the concrete after it is placed. As a consequence some methods of finishing concrete roads have been productive of exceptionally good results. A study of the methods employed shows that while they differ as to detail, in each case the concrete surface has been so treated as to remove a considerable amount of the excess water, thereby making the surface more compact and dense.

Of the different methods which have been observed, that devised by Captain Gaillard, City Engineer of Macon, Georgia, seems to be the most efficient and least expensive. This method consists in rolling the surface of the concrete with a light roller about 8 in. in diameter and 5 to 6 ft. in length, attached to the end of a long pole. The roller is made of light sheet metal, the total weight of a 6-ft. roller being in the neighborhood of 70 lb. The operator stands at one side of the roadway and rolls the newly laid concrete transversely to the direction of the road.

This method was originally developed to remove any unevenness in the surface, but it really accomplishes a very much more important result as it squeezes out of the concrete much of the excess water.

In order to determine the effect on the strength of a concrete produced by the finishing method described above, several slabs were made for testing purposes, mixed and molded in much the same manner as in concrete road work, the exact proportions of water and other materials being recorded. The principal variation was in the consistency of the concrete and the method of finishing the surface.

The tests were made in cooperation with Prof. D. A. Abrams, in charge of the Structural Materials Research Laboratory, Lewis Institute. Professor Abrams gave his personal supervision to all of the details of the tests.

Twelve slabs, 2½ ft. wide, 5½ ft. long and 5 in. in thickness, were made and tested. Pebbles were used as coarse aggregate for six of these and crushed limestone was used for the others.

The concrete was mixed in the proportion of 1 part cement to 4 parts total mixed aggregate by volume—a proportion approximately equivalent to the ordinary 1:2:3 mix. Three sets of slabs, two slabs in each set, were made from both crushed limestone and pebbles as a coarse aggregate.

The following consistencies of concrete were used in the test:

1. Dry consistency, finished with a wood float in the ordinary way;
2. Wet consistency, finished with a wood float in the ordinary way;
3. Wet consistency, finished by means of a roller, as previously described.

The slabs were made on the concrete floor of the laboratory, the form being placed on a sheet of building paper.

The concrete for the slabs of dry consistency was mixed as stiff as could be easily handled—stiffer than is ordinarily found in concrete road work. The mixtures for the remaining slabs contained a somewhat larger amount of water, making a consistency that would ordinarily be classed as "good" in practical work. (See table.)

RESULTS OF TRANSVERSE TESTS OF CONCRETE SLABS FINISHED BY WOOD FLOAT AND BY ROLLER METHOD

Specimen No.	Age at test, days	Total applied load, lb.	Thickness,[1] in.	Kind of coarse aggregate	Water used, percentage of volume of aggregate	Modulous of Rupture of Concrete, lb. per sq. in.			Compressive strength of concrete (6 by 12-in. cylinders), lb. per sq. in.
						Medium consistency, wood-float finish	Wet Consistency		
							Wood-float finish	Roller finish	
1	15	3300	5.20	Pebbles	15.9	301	...	...	....
1a	15	3200	5.14	Pebbles	15.9	302	...	...	2370
2	15	3200	5.18	Pebbles	18.6	...	294	...	1760
2a	15	3500	5.27	Pebbles	18.6	...	311	...	1730
3	15	3850	5.32	Pebbles	18.6	...	...	331	1680
3a	15	3400	5.07	Pebbles	18.6	...	...	325	1680
4	15	4000	5.25	Crushed Limestone	15.9	353	...	...	2130
4a	16	4500	5.18	Crushed Limestone	15.9	405	...	...	2290
6	15	3000	5.11	Crushed Limestone	18.6	...	288	...	1600
6a	16	3750	5.20	Crushed Limestone	18.6	...	340	...	1680
5	15	3650	4.87	Crushed Limestone	18.6	...	...	378	1330
5a	16	4950	5.17	Crushed Limestone	18.6	...	...	433	1800
Average						340	308	369	

[1] Thickness of the slabs at the broken sections.

NOTE.—Concrete was machine-mixed in the proportion of 1 part cement to 4 parts aggregate, by volume. Size of slabs, 30 by 66 by 5 in. Loaded with dead weights at points 15 in. apart on 5-ft. span. Duplicate slabs were made on different days.

All slabs of the stiffer consistency, as well as one of the slabs of each other set, were finished by being first struck off with a straight-edge and then floated by hand with a wooden float. The remaining slabs of each of the wet consistency sets were finished by the use of a roller. The concrete was left a little more than flush with the sides of the mold, and instead of being struck at once with a straight-edge, it was first rolled; the straight-edge was then used to strike off what surplus concrete remained. To bring the full weight of the roller—which was just long enough to rest upon the side forms—on the concrete the slab was rolled transversely at intervals of about 15 minutes for 1½ hours, five rollings being made. The roller was moved back and forth over the width of the slab, moving sidewise a few inches with each stroke. As each rolling was made, considerable water was squeezed out of the concrete and forced over the sides of the mold. The rolling continued until the amount of free water became very small. No particular difference in the amount of rolling to effect this was noticeable for the limestone concrete and the gravel concrete. It was noticed, however, that the roller sank into the gravel concrete considerably more than into the rock concrete during the first one or two rollings.

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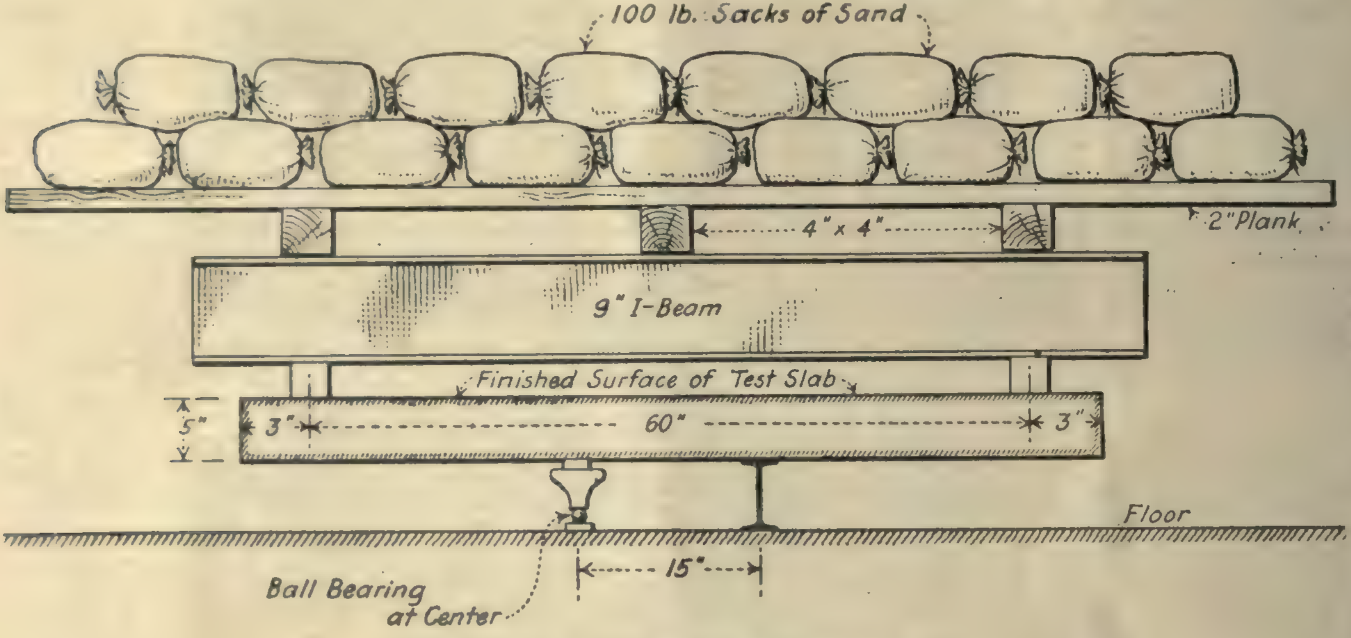
*Paper presented at the 20th annual meeting of the American Society for Testing Materials, Atlantic City, N. J., June 26-29, 1917.

†Consulting Highway Engineer, Portland Cement Association.

The roller used was 2½ ft. long, 6 in. in diameter and weighed about 50 lb. In practical road work, an 8-in. roller about 6 ft. long, weighing about 70 lb., is recommended.

The forms were removed the following day, when the slab was covered with a layer of damp sand which was kept moist until the slabs were one week old. The sand was then removed and the slabs lifted from the floor and permitted to dry out during the remaining eight days before the load was applied.

The arrangement for applying the load to the slabs is shown in the illustration. The slabs were placed on two supports spaced 15 in. on centers, resting on the floor. A ball bearing on the lower side of one support compensated for what warp there might be in the lower surface of the slab. The load, which consisted of 100-lb. sacks of sand, was supported by two 9-in. I-beams, and was transmitted to the slab through two bearings spaced 5 ft. apart. The upper surface of the slab was thus put in tension. Each test was made in the same manner, and as far as practicable the loads were applied at the same rate until rupture.



DEVICE USED FOR TESTING CONCRETE SLABS.

The appearance of the broken slabs disclosed a marked difference between those finished with the roller and those finished with the wooden float. The roller-finished slabs showed a distinctly denser appearance, extending for at least one-half the depth of the slab. It is to be noticed (see table) that the slabs tested when they were 16 days old show a consistent increase in strength over those 15 days old.

With the small number of test specimens, there are not sufficient data to determine definitely any special difference between the strength developed by the slabs made of pebbles and those with the crushed limestone. It is to be noted, however, that the pebbles used were somewhat irregular in shape, some pieces being broken.

The broken sections of all slabs, particularly those that were rolled, showed that many pieces of the coarse aggregate had been broken apart, the number of broken pieces being considerably greater in the rolled slabs than in those not rolled. There was no difference especially noticeable in this particular, between the slabs made of the limestone and those made of the pebbles.

The results of the tests are shown in the table. The noticeable fact is that those slabs finished with the roller developed a very considerable increase in strength over the slabs merely hand-finished. The four slabs of wet consistency that were finished by hand, have an average modulus of rupture of 308 lb. per sq. in., while the four slabs finished with the roller have an average modulus of rupture of 369 lb. per sq. in., or an increase of almost 20%. As would be expected, the slabs that were made of a stiffer mixture, indicated in the table as medium consistency, giving an average modulus of 340 lb. per sq. in., are stronger than those of the wet consistency, finished in the same manner; but the wet-consistency slabs finished with the roller are stronger than those of the medium consistency, showing an increase of nearly 10%.

The results seem to indicate clearly the value to be gained by the use of the roller to finish a concrete road; that it is possible by proper manipulation of concrete to secure increased strength and density of a character most desirable for a concrete road surface; and that such surplus water as may be required to facilitate placing concrete in road work can be effectively removed by this simple expedient.

Expenditures on the Lincoln Highway

A report on the cost of work done on the Lincoln Highway during 1916 shows the sums that were spent in the various states through which it passes.

The cost of repairs and maintenance of the road in New Jersey, where it is completely hard surfaced, was $183,678, or $3,050 per mi. In Pennsylvania the cost was $193,000, or $552 per mi. Ten counties in Ohio placed contracts for surfacing which amounted to $775,000 exclusive of paving in cities. Indiana counties spent $700,000 in improving the road, while available records show that Illinois spent about $335,800 for the purpose. In Iowa the work consisted of grading, draining and maintaining the route at a cost of upwards of $1,000,000. It is stated that in Nebraska $367,300 was expended, chiefly by counties, in the improvement and maintenance of the highway, and that the population along the route in Wyoming spent $10 per capita during the past two years.

GOOD ROADS

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New Series, Vol. XIV
Number 3

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

JULY 21, 1917

MILITARY ROAD BUILDING

At the present time when the attention of engineers and the general public is so concentrated on war and military operations, the road work at the military camp at Mt. Gretna, Pa., which is described elsewhere in this issue, is of particular interest. While in some respects far different from building and maintaining roads in the vicinity of fighting, often actually working under fire, the work being done by the Pennsylvania State Highway Department is still similar to such operations in a number of ways.

One of the essentials of the road work in connection with military operations is speed. It is not sufficient to build roads; they must be ready when wanted, and that may be in less time than the civilian engineer would consider sufficient for the preliminary work. As stated by Maj. Bond in his book, "The Engineer in War:" "In military construction the element of cost is of secondary importance, but the question of time is paramount." The time element is present in the Mt. Gretna work, the schedule on which the work is being carried out calling for the building of 2 mi. of water bound macadam road each week for about three weeks.

The Mt. Gretna work differs from building roads for military operations in the field in the amount and character of the equipment employed. A very complete plant is being operated in the Pennsylvania work, while in the book previously referred to, it is pointed out that in field operations often no plant is available and that the use of elaborate equipment "will seldom be either practicable or advisable under war-time conditions." Common labor and explosives, it is pointed on the other hand, would generally be plentiful. This suggests that after the war is over and the lessons learned by engineers can be applied to the prosecution of the projects of peace, explosives may be used in road work more extensively than they are at present.

This war has been full of surprises. The end of them is not yet in sight and it is entirely possible that in some way the road builders of this country may have to exercise their abilities in the building of roads for war purposes. For that reason and because it is always possible to learn from the methods followed by others, it will be well for American highway engineers to study the theory of military road building and to familiarize themselves as much as possible with the methods followed in actual practice.

MOTOR TRUCKS TO CARRY FOODSTUFFS AND ROADS TO CARRY THE TRUCKS

Increases in the amount of foodstuffs and other products transported by motor trucks and in the distances hauled by this means have already been pointed out in these columns as probable results of America's taking part in the world war. That these increases are going to be large and immediate is evidenced by a recent report of the moving of crops in the southern part of New Jersey.

According to these reports, produce from that section is being sent to city markets in less time than ever before, and at a slightly lower cost. It is carried in motor trucks, most of which are owned by the farmers, but some of which are operated by companies or individuals who make a business of transporting vegetables and fruits for those growers who have no trucks of their own.

It is said that when shipments were made by railroads it was necessary to have produce packed and delivered at the shipping points by four o'clock in the afternoon. Fast freight trains were scheduled to reach the city a little after midnight, but it is claimed that shipments were frequently so delayed that the produce had to be held over for the next day, with the result that the farmers suffered considerable loss during the season. When carried by trucks the foodstuffs can be shipped later and can be gotten to the city markets in a few hours. They are received during the evening and in the morning are in good condition.

There is nothing new in motor truck transportation of food supplies, and it would have grown more and more common even under normal conditions. It is likely, indeed, that the truck would have made very rapid progress as a competitor of the railroad, but it is not likely that motor truck transportation would have grown in favor as rapidly as it will under the conditions now obtaining. What has been done in getting southern Jersey's products to the Philadelphia market is being done elsewhere and will be done more and more as the necessity for moving food supplies becomes greater and the railroad congestion becomes more acute.

In all this there is one of the strongest possible arguments for good roads. As valuable as it is as a means of transportation, the motor truck is useless unless there are roads—good roads. There is enough productive land in the United States for raising all the food the country needs to produce, and if the producers of food can be assured means of marketing their crops at a fair profit there will be no lack of farmers and farm workers.

Enormous supplies of food are wasted every year because of the impossibility of getting them to market at the right time.

The food problem in America is one of transportation rather than of production, and transportation is more and more a matter of roads. It is possible to produce all that is needed and it is possible to get the food to markets and to large centers of distribution. But to do it roads must be built and maintained. The roads must be made strong enough to take the traffic they will be called upon to carry and the roads must be kept in condition to carry the traffic at the times produce has to be moved.

More—not less—road work should be the program for the duration of the war.

New Laws Aid Highway Development in Wisconsin

A large amount of constructive highway legislation was passed by the Wisconsin legislature of 1917. The most important of these measures, according to a statement of State Highway Engineer A. R. Hirst, is the state trunk highway law. Mr. Hirst is quoted as follows:

"This law was enacted to enable Wisconsin to take advantage of the law providing for federal aid for roads, which federal aid in the period from 1916 to 1920, inclusive, totals nearly $2,000,000. In brief, this law provides that the State Highway Commission shall lay out a system of 5,000 mi. of main highway, inter-connecting every county seat and city of over 5,000 in population in the state. This system of roads is called the state trunk highway system and on it must be expended all construction funds (amounting to $6,000,000) available from the federal government, the state and the counties in 1918, 1919 and 1920.

"The state and federal aid available is divided between the counties one-third on the basis of area, one-third on the basis of road mileage, and one-third on the basis of valuation. The maintenance of this system after May 1, 1918, is to be performed by the counties under the control of the State Highway Commission, the funds for the maintenance being provided from automobile license fees, which also furnish the state's one-third share of the cost of construction.

"Immediately upon the passage of the state trunk line bill it became evident that many of the towns and counties were deliberately abandoning all projects for construction and maintenance on roads which they assumed would be on the state trunk system. Money previously available for its improvement under the state aid law was moved to other roads in many cases. The joint committee considered this matter and there was formulated and passed bill 650S, which provides that one-half of the state aid funds available in each county must hereafter be expended on the state trunk line system until this system is completed in each county. The bill also provides that towns and villages not served by the trunk line system should receive in proportion to their valuation the other half of the state aid funds, but that the place of expenditure in each town and village should be selected by the county board.

"Bill 590-A was also passed. This provides that cities of all classes may receive state aid on streets and roads lying in the outlying portion of them. The bill as passed meets the views of the League of Wisconsin Municipalities and will go far toward solving the problem of improvements in the outlying sections of cities, which improvements have been impossible to finance under either the state aid law or under the existing laws for city paving, and it is expected that in a few years the unsightly mud holes on the outer edges of some of our cities will be done away with."

New Highway Commission of New Jersey

The new Highway Commission of New Jersey, appointed by Governor Edge in conformity to the changes made in the highway law of the state by the 1917 Legislature, consists of G. E. Blakeslee, of Jersey City; Walter J. Buzby, of Atlantic City; Watson G. Clark, of Tenafly; G. W. F. Gaunt, of Mullica Hill; John W. Herbert, of Helmetta; Ira A. Kip, Jr., of South Orange; Col. Anthony Kuser, of Bernardsville, and Col. E. A. Stevens, of Hoboken. These appointments were noted in "Good Roads" and a review of the chief provision of the law was printed in the issue of April 21.

G. E. Blakeslee, who was born in Bridgeport, Conn., in 1873, is President of the Crescent Automobile Co., of Jersey City. At an early age he obtained employment in a bicycle shop in Bridgeport, later coming to New York City, and then obtaining employment in Jersey City. Leaving the bicycle business to enter the automobile field he became one of the first automobile salesmen in New Jersey. Mr. Blakeslee made a record trip by automobile from Detroit, Mich., to Jersey City in 1911 and during the following year attempted the drive again, but was wrecked near Buffalo after having beaten his previous record for that portion of the trip by seven hours. He has taken an active interest in road improvement for a number of years and was one of the leaders in the campaign for the $7,000,000 bond issue in New Jersey last fall.

Watson G. Clark, M. Am. Soc. C. E., was born at Cresskill, N. J., in 1871. He secured his engineering education at New York University, receiving a B. S. degree in 1891 and his professional degree the next year. He was engaged in general engineering work with Charles B. Brush, of Hoboken, N. J., until 1896, when he established his own business. He has since carried on a general practice, but has specialized on municipal work, including pavements. Mr. Clark was the engineer on the construction of the Englewood Approach from the Dyckman Street Ferry to the top of the Palisades at Englewood, N. J. Mr. Clark now maintains offices in New York City.

George W. F. Gaunt, Master of the New Jersey State Grange, was born on a farm in Mantua Township, Gloucester County, N. J., Sept. 9, 1865. He resided there until 1901, when he bought the farm he now owns and operates near Mullica Hill. Mr. Gaunt has been Master of the State Grange for about fifteen years. He was Lecturer of the National Grange for four years and in 1909 was elected High Priest of the national organization. In 1913 he was again elected Lecturer for a two-year term.

In 1908 Mr. Gaunt was elected to the New Jersey State Senate. He was reelected in 1911 and returned for a third term in 1914. Upon the resignation of Wm. T. Read as president of the Senate last year, Mr. Gaunt was chosen to fill the vacancy and was elected president for the 1917 session. During his service in the Senate he has taken an active part in road legislation and served on the highways committee in the 1917 session.

John Warne Herbert, Jr., was born at Wickatunk, Monmouth County, N. J., Aug. 3, 1853. He received his early education at Marlboro, N. J., and at the Glenwood Institute at Matawan, N. J. He entered the Scientific Department of Rutgers College in 1869, graduating in 1872 and three years later receiving the M. S. degree.

Finding civil engineering uncongenial, Mr. Herbert took up the study of law in the office of Capt. Albert S. Cloke at Jersey City the year after graduating from Rutgers. In 1874 he entered the Columbia Law School. In 1876 he received the degree of L. L. B., and in May of that year was admitted to the bar in New York as an attorney and counsellor at law. He was admitted to the New Jersey bar as an attorney at law in 1877 and three years later as a counsellor at law. He was appointed Master in Chancery of New Jersey in 1879 and a Special Master in Chancery in 1886.

Mr. Herbert gave up the practice of law in 1889 to become Vice President of the Geo. W. Helme Co., of Helmetta. In 1900 he became interested in railroad properties and resigned from the Geo. W. Helme Co. to assume the presidency of the Niagara, St. Catherines and Toronto Railroad Co. and the Niagara, St. Catharines & Toronto Navigation Co., and the vice presidency of the Hudson Valley Railroad Co.

Mr. Herbert was elected Mayor of Helmetta in 1890 and held that office until 1902. He is a life trustee of Rutgers College, a member of a number of clubs and a director in several corporations.

G. E. BLAKESLEE.

WATSON G. CLARK.

Col. Anthony Kuser is a resident of Bernardsville. He is a director and Vice President of the Public Service Corporation of New Jersey and a director of a large number of its subsidiaries. He is also a director of the Columbia Trust Co., of New York, and of various other corporations.

JOHN W. HERBERT.

COL. E. A. STEVENS.

WALTER J. BUZBY.

Col. E. A. Stevens, formerly Commissioner of Public Roads of New Jersey, was born at Philadelphia, Pa., March 14, 1858. He graduated from Princeton in 1879 with the degree of A. B. and was later given the degree of Doctor of Engineering by Stevens Institute of Technology. Col. Stevens is an engineer of wide reputation and has also held a number of public offices. He is president of the Hoboken Land Improvement Co. and a trustee of Stevens Institute of Technology. He was colonel of the 2d Regiment, N. J. N. G. and served as president of the New Jersey Commissioners of the Palisades Interstate Park.

Col. Stevens is best known to road builders through his connection with the New Jersey road work, having served as Commissioner of Public Roads from 1911 until the taking effect of the law creating the present commission. He is a life member and a vice president of the American Society of Mechanical Engineers, a vice president of the Society of Naval Architects and Marine Engineers, and a member of the American Society of Civil Engineers and of the Institute of Naval Architects (Great Britain).

GEORGE W. F. GAUNT.

COL. ANTHONY R. KUSER.

MEMBERS OF THE NEW JERSEY HIGHWAY COMMISSION.

Military Road Building in Pennsylvania

(*Continued from page 26*)

the teeth of the harrow practically ride on the upper surface of the stone. Stone screenings are then spread lightly from piles at the sides and followed by sprinkling and rolling alternately, adding the necessary amount of screenings during the operation in order to bond up the ballast stone thoroughly. This course is 4 in. in depth when compacted. The rolling and sprinkling is continued until a surface mortar is produced and the road shows no wave under the operation of the roller. When this is completed, the surface is to be opened to traffic for a few days and thereafter given an additional rolling and finishing in order to compact uniformly and completely all portions of the surface.

"Upon the finished road surface, after the fine material has been swept off, a bituminous treatment of .4 gal. per sq. yd. is to be applied with motor pressure distributors, using department Class "C" specification material, and covered with trap rock chips in quantities ranging from 15 to 20 lb. per sq. yd., applied with mechanical spreaders."

Standards of the Kentucky Department of Public Roads for Concrete and Steel Highway Bridges

(*Continued from page 30*)

the 180-ft. span was reached. For the 180-ft. span and spans beyond, 64 lb. per sq. ft. was used in the design. For impact, 25% was added to the above loads.

Excellent results are being obtained from the type of wooden flooring now employed. The floor consists of 2x4-in. white oak timbers laid on edge and fastened to the nailing strips by 20d nails and to each other every 2 ft. by 16d nails. The nailing strips are of creosoted timber and are fastened to the top of each stringer by bolts. Each piece of 2x4 is thoroughly swabbed with hot tar along the sides in contact and the pieces are laid as close together as possible. The nailing strips are so arranged as to give a crown of 1 in. to the finished roadway.

The stringers used on the standard spans will permit the use of a reinforced concrete or wood block floor at a later date without change. In designing the stringers for 4-in. wooden floor or wood block flooring it was assumed that each of the stringers, spaced 24 in. center to center, carried one-half the concentrated live loads thereon. The maximum spacing allowed for the 4-in. flooring is 27 in., center to center of stringers. The load carried by each stringer was determined by dividing the spacing of stringers, center to center, in inches, by 48 and multiplying by the total wheel loads on the stringer. For concrete floors it was assumed that stringers spaced at 30 in., center to center, carried one-half the concentrated load, and for other spacings the live load carried by each stringer was obtained by dividing the center to center spacing of stringers, in inches, by 60 instead of 48, and multiplying by the total wheel loads on the stringers.

In the design of the lateral systems, the wind pressure was assumed acting in either direction horizontally at 30 lb. per sq. ft. on the exposed surfaces, as seen in elevation, and in addition thereto a horizontal live load of 100 lb. per lin. ft. of span was assumed as acting in the plane of the loaded chord. In spans up to and including the 150-ft. span, no additional provision was made in end post due to the wind. However, in spans above 150 ft. in length, wind is considered. The total area opposing the wind was determined by adding together the areas of twice the vertical projection of the windward truss, railings, hub guards, blocking, flooring and ends of floorbeams.

Many bridges are allowed to rust because the rust is not readily apparent. It has appeared wise, therefore, to the department to ultilize a paint for the two final field coats which will not only show the rust, but also will make a bridge clearly visible at night. We, therefore, have utilized a light paint for the two field coats.

Thus the department is endeavoring to furnish the counties of Kentucky with standard plans which will not only fulfill the present conditions, but be strong enough to suffice for some time to come. It will be noted that no short span steel bridges are designed but instead reinforced concrete is employed, including the approaches to steel bridges. Every effort has been made to minimize maintenance charges.

Road Bond Elections in Texas

Bond elections have been ordered in Texas as follows: San Jacinto County, Road District No. 4, $75,000, July 26; Hunt County, Wolfe City District, $100,000, Aug. 4; Uvalde County, Precinct No. 2, $60,000, Aug. 11; Calhoun County, Road District No. 2, $75,000, Aug. 14.

Missouri Counties Consider Large Bond Issues

A number of counties in the southeastern part of Missouri are planning to hold bond elections for the purpose of raising funds with which to construct county highway systems. It is stated that an effort will be made to have these elections called during the summer or early fall.

The amounts of proposed issues for some of the counties are as follows: Cape Girardeau, $1,000,000; Mississippi, $375,000; New Madrid, $850,000; Phelps $375,000; Ripley, $400,000.

An Opinion on the Texas Highway Law

An opinion as to certain features of the new law regulating the use of motor vehicles in Texas has been rendered by the Attorney General of the State in response to a request from the Chairman of the State Highway Commission.

Answering the question as to whether or not a passenger carrying car of less than 2 tons' capacity would be rated per horse power or classed as a commercial vehicle, and if the latter, at what rate, the opinion given was that a fee of 35 ct. per horse power would apply, under the law requiring that motor vehicles including commercial cars with a carrying capacity of 1,000 lb. and less be charged 35 ct. per horse power.

Whether or not a truck privately owned and operated, having a carrying capacity of more than 1,000 lb. per wheel, which did not carry passengers or freight for hire, but was in private service of individuals, should be classed as a commercial car, was answered by "No"; that it was not a commercial vehicle within the meaning of the law, which states that a commercial vehicle "shall be one carrying passengers for hire," and that it should be rated at 35 ct. per horse power.

A motor vehicle of a total capacity per wheel of more than 1,000 lb., carrying passengers or freight for hire, was designated as a commercial vehicle, the fee being based upon the carrying capacity of the car and not upon the load hauled as evidenced by the language used in the act: "For each commercial vehicle the annual fee shall be based upon the carrying capacity per wheel."

The schedule of graduated fees as shown in the issue of May 19 is as follows:

Wt. in lb. per wheel	Fee
1,001 to 2,000	$20.00
2,001 " 4,000	40.00
4,001 " 6,000	60.00
6,001 " 8,000	150.00
8,001 " 10,000	300.00

MEETINGS

Calendar of Coming Meetings

July 26-27.—League of Michigan Municipalities.—Annual convention, Grand Rapids, Mich. Secretary, Charles A. Sink, Ann Arbor, Mich.

August 15-17.—League of Wisconsin Municipalities.—Annual convention, Racine, Wis. Secretary, Ford W. MacGregor, Madison, Wis.

August 22.—Union of New Brunswick Municipalities.—Annual convention, St. John, N. B. Secretary, James King Kelley, St. John, N. B.

August 27-29.—Union of Canadian Municipalities.—Annual convention, London, Ont. Secretary, W. D. Lighthall, K.C., Westmount, P. Q.

Aug. 29-31.—Ontario Municipal Association.—Annual convention, Toronto, Ont. Secretary, B. H. Spence, 705 Lumsden Building, Toronto, Ont.

Sept. 5-8.—League of American Municipalities.—Annual convention, Gary, Ind. Secretary, Robert E. Lee, City Hall, Baltimore, Md.

Good Roads Meeting in Arkansas

A large attendance from the states of Arkansas, Missouri and Oklahoma is expected at a good roads convention to be held at Eureka Springs, Ark., on July 24, 25 and 26.

The people of northwestern Arkansas are seeking to secure the construction of an improved road from Henrietta and Okmulgee, Okla., to Fayetteville, Ark., continuing by way of Springdale and Rogers, Ark., to Monett, Mo. Here the road would join with improved transcontinental highways. A feature of the proposed route is that it would traverse the Pea Ridge battle grounds and other points of historic interest.

League of Michigan Municipalities

The nineteenth annual convention of the League of Michigan Municipalities will be held at the Hotel Pantlind, Grand Rapids, Mich., on Thursday and Friday of next week, when a number of municipal topics will come up for discussion. Mayors P. C. Fuller, of Grand Rapids, and J. G. Reutter, of Lansing, are expected to be present, the former delivering the address of welcome and the latter responding.

The program contains an address by Manley Osgood, City Engineer of Ann Arbor, Mich., on "Paving and Road Building."

A banquet will be tendered by the citizens of Grand Rapids to the visiting delegates on Friday evening.

North Carolina Good Roads Association

The first day of the annual convention of the North Carolina Good Roads Association, held at Asheville, N. C., on July 9, 10 and 11, was devoted to the registration of delegates and other preliminary matters. The business sessions opened Tuesday morning, the 10th, the program of the day including addresses of welcome on behalf of the city, county and civic bodies, and the reports of officers of the association. In the afternoon Sen. R. S. McCoin discussed the "State Wide County Road Law," and was followed by D. M. Clark on "State Security for County Bonds." Benehan Cameron, of the State Highway Commission, explained the automobile tax law of the state of which he is the author.

"A State System of Maintenance" was the subject of an address by W. S. Fallis, State Highway Engineer of North Carolina, on Wednesday morning, road maintenance being the topic also chosen by J. Roy Pennell, State Highway Engineer of South Carolina, and by R. W. Brown, Maintenance Superintendent of Davidson County, North Carolina. Other addresses of interest were heard during the convention.

King of Trails Association

The first convention of the King of Trails Association held at Kansas City, Kan., last week, had an attendance of six hundred delegates at its opening session. It was decided to employ a manager to devote his entire time to organization work in the counties through which the road is located. The route of this highway extends from Winnipeg, Manitoba, to Galveston, Texas, a distance of 2,000 mi. Plans are under way for the improvement of the highway between Fort Leavenworth, Kan., and Fort Cook, Neb., in accordance with federal specifications, after which the government will assume the road and share the cost of its maintenance.

PERSONAL NOTES

John Meegan has been appointed City Engineer of Burlington, Wash.

F. J. Postel, of Chicago, has been appointed Supervising Engineer in the Illinois State Department of Public Works.

T. J. Wright has resigned as County Engineer of Benton County, Washington, and will enter the practice of general consulting engineering in Seattle.

A. G. Steele, a paymaster in the State Highway Department of Pennsylvania, has resigned to accept a position in the State Treasury Department. He assumed his new duties on July 16.

W. W. Marr, Chief Highway Engineer of Illinois, has been reappointed to that office under the new administration of public affairs which places the work of the former State Highway Commission under the direction of the Director of Public Works and Buildings.

Walter F. Brooks, Senior Highway Engineer of the U. S. Office of Public Roads and Rural Engineering, has been placed in charge of the building of 20 mi. of streets at the military cantonment at Louisville, Ky. Mr. Brooks has been directing road work in the western part of the state.

Thomas A. Hamilton, formerly Superintendent of the East St. Louis plant of the Zelnicker Car Works, and for the past fourteen years connected with the Crane Company, now represents the Walter A. Zelnicker Supply Co., of St. Louis, Mo., and affiliated companies, with headquarters at 1018 Woodward Building, Birmingham, Ala. He will have charge of both buying and selling in the southeastern territory.

Charles M. Upham, State Highway Engineer of Delaware, accompanied by Secretary William Francis, recently completed a tour of Pennsylvania, New York and New Jersey, which was made for the purpose of investigating the various systems of road reports and traffic census taking. It is said to be the intention of the Delaware Highway Commission to adopt the best features of the system used in each state for its method of handling such reports.

PUBLICATIONS

STATE OF NEW YORK, COMMISSION OF HIGHWAYS. Official Bulletin for 1916. Paper, 5¾ x 9 in., 405 pp.

A series of tables giving detailed information and the status of all state and county highways the plans for which were approved by the highway commission and boards of supervisors in the respective counties in which they were located in 1916 is contained in this bulletin.

DEPARTMENT OF PUBLIC HIGHWAYS, ONTARIO, CANADA. Report on Street Improvement for the year 1917. Paper, 6½ x 9⅝ in., 200 pp.; illustrated.

This report, prepared by the Deputy Minister of Highways of Ontario, contains first a general article on street improvement presented under eleven subheadings as follows: I—Street Expenditure; II—The Street Plan; III—Proportioning of Streets; IV—Selection of Pavements; V—Materials Used in Pavements; VI—Oiling Roadways; VII—Street Intersections; VIII—Permanent Grades; IX—Drainage; X—Foundations; XI—Report on Street Improvement. Street paving in Toronto, Ottawa, and the more important cities of the province is treated separately. The text is accompanied by a number of illustrations showing streets and bridges in the various municipalities. The report concludes with a table showing the extent and types of paving in the cities and towns of Ontario, and a complete index.

AUTOMOBILE REGISTRATIONS, LICENSES, AND REVENUES IN THE UNITED STATES, 1916. Prepared by the Division of Road Economics of the Office of Public Roads and Rural Engineering, U. S. Department of Agriculture. Circular No. 73 of the Secretary of Agriculture. Paper, 6 x 9 in., 15 pp.

A review of the progress made in motor car usage in the United States, and a comparative statement of registration, licenses, and revenues derived therefrom for the year 1916 are contained in this circular. There are three pages of text, the remaining pages being occupied by four tables in which information on the following subjects, arranged by states, is presented: Table I—Motor vehicle registrations, licenses, and revenues, 1916; Table II—Motor car registrations and gross motor vehicle revenues, 1913 to 1916; Table III— Motor vehicle registration and license fees in force Jan. 1, 1917; Table IV—Administrative provisions in force Jan. 1, 1917, affecting motor vehicle registrations, licenses, and revenues.

A PRELIMINARY REPORT ON BLENDED PORTLAND CEMENT, by Edgar S. McCandliss, C.E., Assistant Professor of Civil Engineering, University of Missouri. Bulletin for February, 1917, of the School of Mines and Metallurgy of the University of Missouri. Paper, 6 x 8¾ in., 66 pp. and covers; illustrated.

This bulletin is one of a technical series issued by the School of Mines and Metallurgy of the University of Missouri, and is the result of a study of sand-blended cements undertaken in conjunction with regular class work. The report gives the tests on the question of whether or not Portland cement can be blended with sand to produce a sand-blended cement having the same general physical properties as Portland cement. A report on the results of the study of other questions of blended Portland cement will be completed in October, 1917. The present volume takes up the matter of calcareous cements, the selection of materials for use in making tests, the procedure followed, and the results. Tables showing relative strengths are accompanied by diagramatic illustrations. Other tables contained in the bulletin give the results of tension tests and of compression tests of both neat and mortar specimens.

STATE OF CALIFORNIA, DEPARTMENT OF ENGINEERING. Fifth biennial report—Dec. 1, 1914, to Nov. 30, 1916. Paper, 6 x 9 in., 465 pp.; illustrated, inset map.

Part III of the biennial report contained in this volume is devoted to the state roads and highways of California. It includes a financial statement of the expenditures made in the maintenance and improvement of state roads during the two years by the state highway engineer, and an appendix showing the expenditure on appropriations from Nov. 1, 1914, to June 30, 1916. The half-tone illustrations showing views of various state roads and bridges are well selected and exceptionally interesting. The remainder of the volume is devoted to other divisions of the work of the Department of Engineering. The illustrations consist of a large number of plates, with diagrams and inset maps.

AMERICAN WOOD-PRESERVERS' ASSOCIATION. Proceedings of the Thirteenth Annual Meeting at New York, N. Y., January, 1917. Paper, 6 x 8¾ in., 538 pp. and index; illustrated.

This report contains the constitution of the association, a list of officers from the year 1905 to and including the year 1917, the personnel of present committees, list of members and classification of membership. As a part of the 1917 convention proceedings it contains the president's address, the annual report of the secretary-treasurer, and the reports of the various committees, with papers and discussions. A section devoted to statistical data relates to wood treated and preservatives used in the United States in 1918, illustrated with tables and diagrams, and to wood preserving plants in the United States, Canada and Mexico. The contents of proceedings of conventions held from 1905 to and including 1916, are also included in the report.

NEWS NOTES

The Des Moines River at Des Moines, Iowa, is to be bridged at a cost of $400,000.

The Authorities of Wayne County, West Virginia, are planning a bond issue of $1,000,000 for the construction of new roads.

Plans for Street Paving and Other Work in Collingswood, N. J., have been authorized by the Borough Council in connection with the recently approved bond issue of $240,000 for improvements in that borough.

The Cost of Reconstructing Roads in Allegheny County, Pennsylvania, for which contracts were recently awarded amounts to $820,803.90. Nineteen roads, representing 33.08 mi., will be improved, the types of construction to be used being asphaltic concrete, brick and reinforced concrete.

The Presence of Sandstone in a Large Shipment of Rock for use in paving streets in Sioux City, Ia., caused the rejection of eight car loads of the material. It is stated that a rigid inspection is made of stone to be used in street construction since the city adopted concrete paving specifications.

Eighty Miles of Highways in Douglas County, Illinois, have been selected as the county system of improved highways by the road and bridges committee of the Board of County Supervisors. The system, if adopted, will connect all the cities, towns and villages in the county and will form through routes with improved roads in Champaign, Edgar and Coles Counties. It is estimated that by utilizing the roads and streets already constructed the system can be completed at a cost of $750,000 which it is believed can be raised by a bond issue.

GOOD ROADS

A Weekly Journal of Road and Street Engineering and Contracting

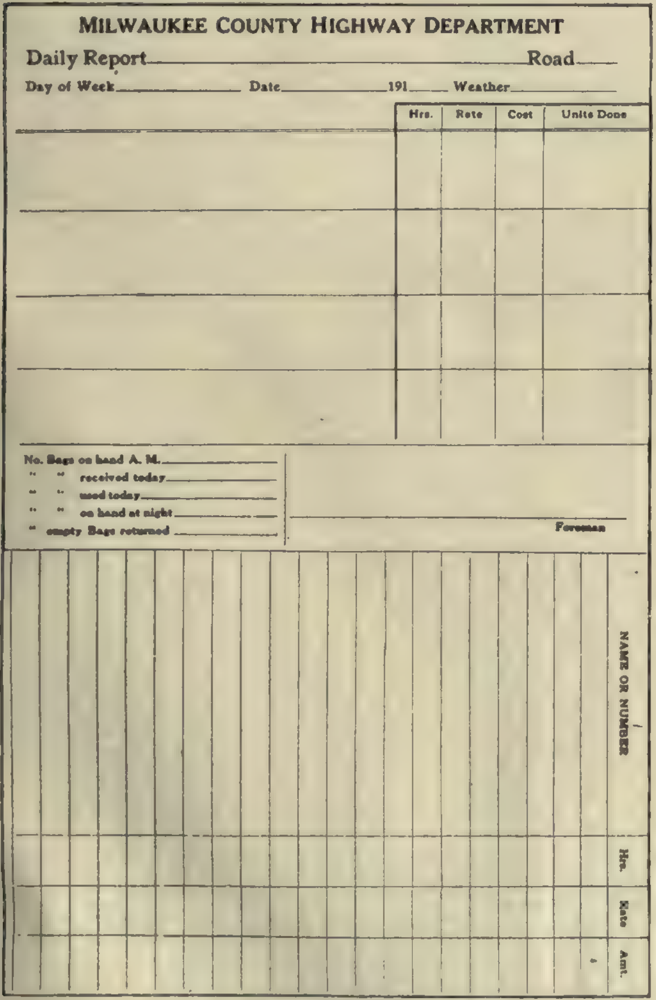
Old Series, Vol. LII.
New Series, Vol. XIV.

NEW YORK, JULY 28, 1917

Number
4

Accounting Forms of the Highway Department of Milwaukee County, Wisconsin

In Milwaukee County, Wisconsin, the volume of work done annually by the Highway Department increased from about $120,000 worth in 1912 to approximately $787,000 worth in 1916. When the department began its work the standard accounting system of the State Highway Department was installed, the forms used being the same as those employed in other county work throughout the state. This system was followed successfully elsewhere but in Milwaukee County the rapidly increasing expenditures made necessary various changes in methods. The system finally put into operation was briefly described in the fifth annual report of the County Highway Commissioner and the section relating to this phase of the county work was printed in a previous issue of "Good Roads." ["Accounting System of the Milwaukee County, Wisconsin, Highway Department," "Good Roads," May 12, 1917, page 286.]



MILWAUKEE COUNTY HIGHWAY DEPARTMENT

Daily Report____________________**Road**____

Day of Week________ Date________191___ Weather________

	Hrs.	Rate	Cost	Units Done

No. Bags on hand A. M.________
" " received today________
" " used today________
" " on hand at night________
" empty Bags returned________

________________ Foreman

NAME OR NUMBER

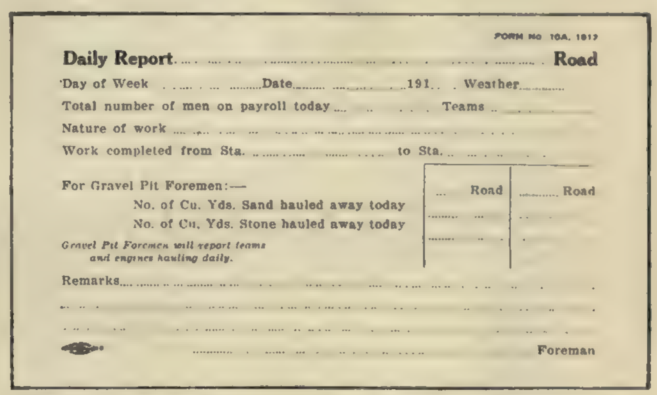
Hrs.

Rate

Amt.

FIG. 1.—FOREMAN'S DAILY REPORT.

About twenty different forms are used for recording various features of the work. Through the courtesy of County Highway Commissioner H. J. Kuelling, reproductions of the principal forms are shown on this and the following pages.



FORM NO. 10A. 1917

Daily Report .... **Road**

Day of Week .... Date .... 191.. . Weather..........

Total number of men on payroll today .... Teams ....

Nature of work ....

Work completed from Sta. .... to Sta. ....

For Gravel Pit Foremen:—

	... Road	.... Road
No. of Cu. Yds. Sand hauled away today		
No. of Cu. Yds. Stone hauled away today		

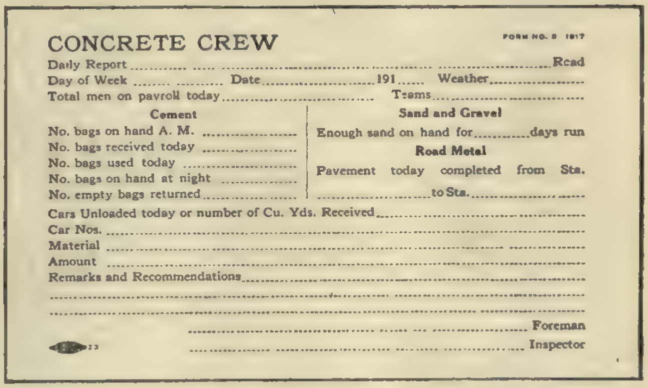
Gravel Pit Foremen will report teams and engines hauling daily.

Remarks....................................

.... Foreman

FIG. 2.—INSPECTOR'S DAILY REPORT—GRADING.

The form shown in Fig 1, is used by foremen on day labor or force account work. It is a white card about 5x8 in. in size, ruled and printed as shown. In the left-hand column on the upper half of the card the foreman enters the kind of work done, such as excavation, form work, pouring concrete, etc. In the remaining columns on the upper half he enters the work done, in bulk not for each individual workman. The lower half is used for keeping the time of the individual laborers, while in the center is space for a cement



CONCRETE CREW

FORM NO. 8 1917

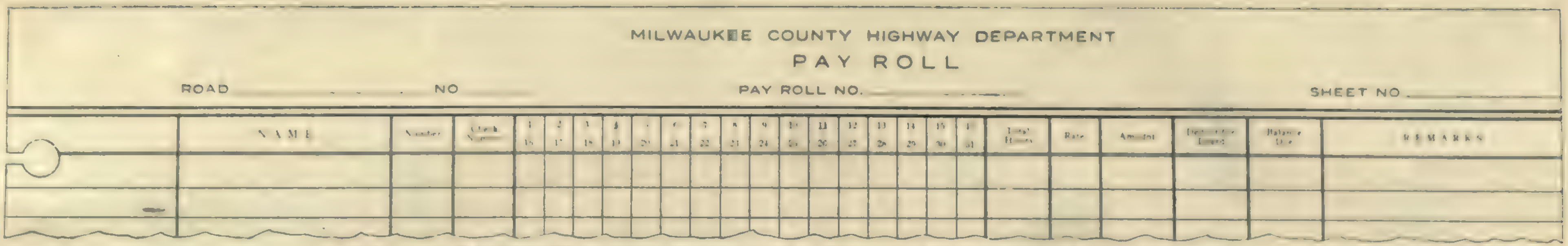
Daily Report .... Road
Day of Week .... Date ....191...... Weather....................
Total men on payroll today.............................. Teams..............................

Cement	Sand and Gravel
No. bags on hand A. M.	Enough sand on hand for............days run
No. bags received today	**Road Metal**
No. bags used today	Pavement today completed from Sta.
No. bags on hand at night	......................to Sta..............................
No. empty bags returned..................	

Cars Unloaded today or number of Cu. Yds. Received..............................
Car Nos. ....
Material ....
Amount ....
Remarks and Recommendations..............................

.... Foreman
.... Inspector

FIG. 3.—INSPECTOR'S DAILY REPORT—CONCRETING.



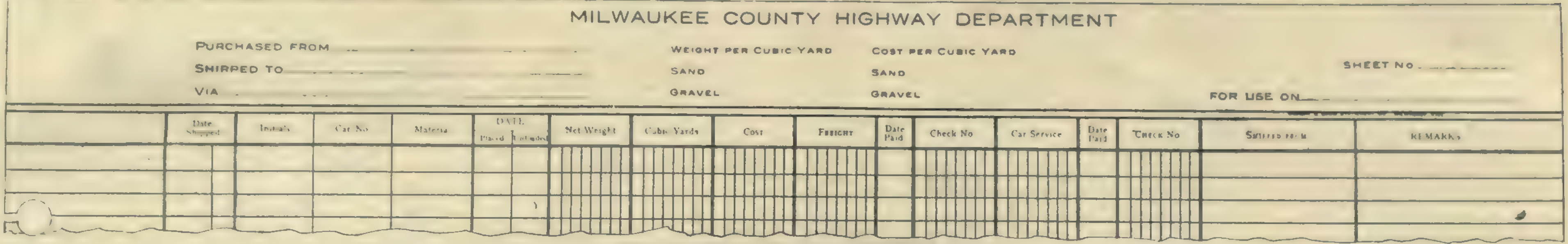
MILWAUKEE COUNTY HIGHWAY DEPARTMENT

PAY ROLL

ROAD ______ NO ______ PAY ROLL NO. ______ SHEET NO ______

	NAME	Number	[illegible]	1 16	2 17	3 18	4 19	5 20	6 21	7 22	8 23	9 24	10 25	11 26	12 27	13 28	14 29	15 30	 31	[illegible]	Rate	Amount	[illegible]	Balance Due	REMARKS

FIG. 4.—PAY ROLL FORM—FOREMEN'S REPORTS (FIG. 1) ARE DRAWN OFF TO THIS FORM.



MILWAUKEE COUNTY HIGHWAY DEPARTMENT

PURCHASED FROM ______
SHIPPED TO ______
VIA ______

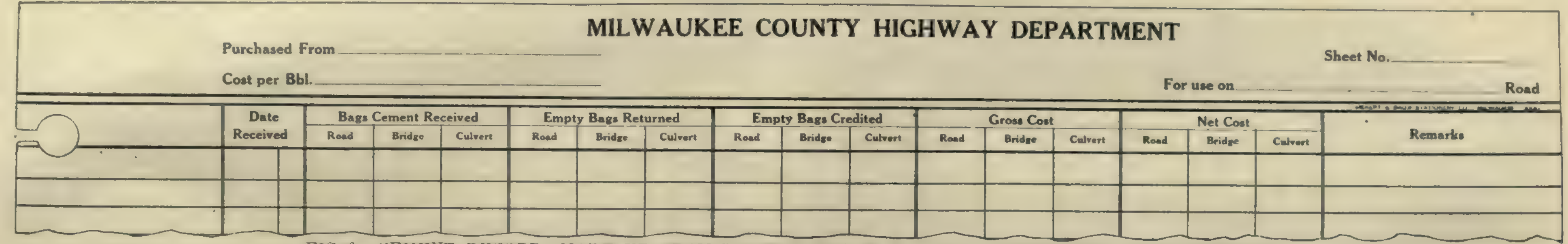
WEIGHT PER CUBIC YARD
SAND
GRAVEL

COST PER CUBIC YARD
SAND
GRAVEL

SHEET NO. ______
FOR USE ON ______

	Date Shipped	Initials	Car No	Material	DATE		Net Weight	Cubic Yards	Cost	Freight	Date Paid	Check No	Car Service	Date Paid	Check No	Shipped from	REMARKS
					Placed	Unloaded											

FIG. 5.—FORM FOR CAR RECORD.



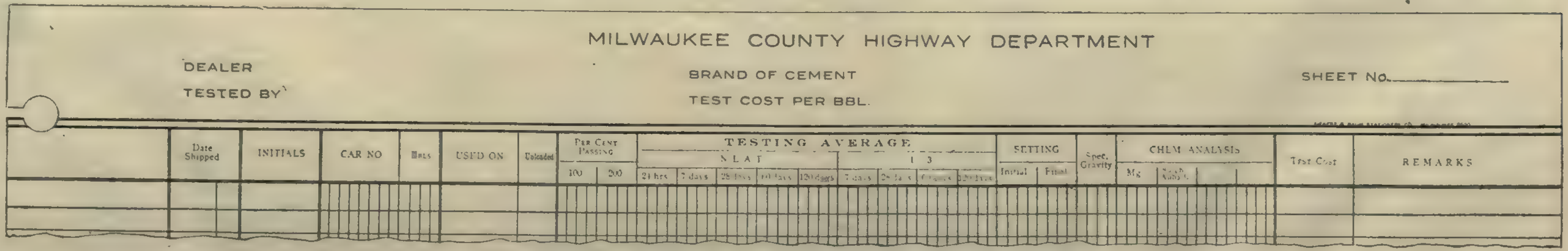
MILWAUKEE COUNTY HIGHWAY DEPARTMENT

Purchased From ______
Cost per Bbl. ______

Sheet No. ______
For use on ______ Road

	Date Received	Bags Cement Received			Empty Bags Returned			Empty Bags Credited			Gross Cost			Net Cost			Remarks
		Road	Bridge	Culvert	Road	Bridge	Culvert	Road	Bridge	Culvert	Road	Bridge	Culvert	Road	Bridge	Culvert	

FIG 6.—CEMENT RECORD—MADE UP FROM TICKETS SENT IN WITH INSPECTORS' DAILY REPORTS.



MILWAUKEE COUNTY HIGHWAY DEPARTMENT

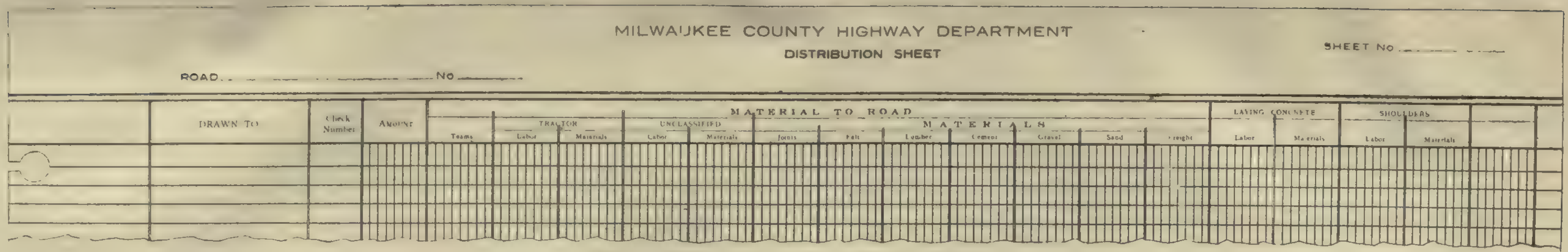
DEALER
TESTED BY

BRAND OF CEMENT
TEST COST PER BBL.

SHEET No. ______

	Date Shipped	INITIALS	CAR NO	Bags	USED ON	Unloaded	Per Cent Passing		TESTING AVERAGE									SETTING		Spec. Gravity	CHEM ANALYSIS				Test Cost	REMARKS
									NEAT					1 : 3												
							100	200	24 hrs	7 days	28 days	[illegible]	120 days	7 days	28 days	[illegible]	[illegible]	Initial	Final		Mg	[illegible]				

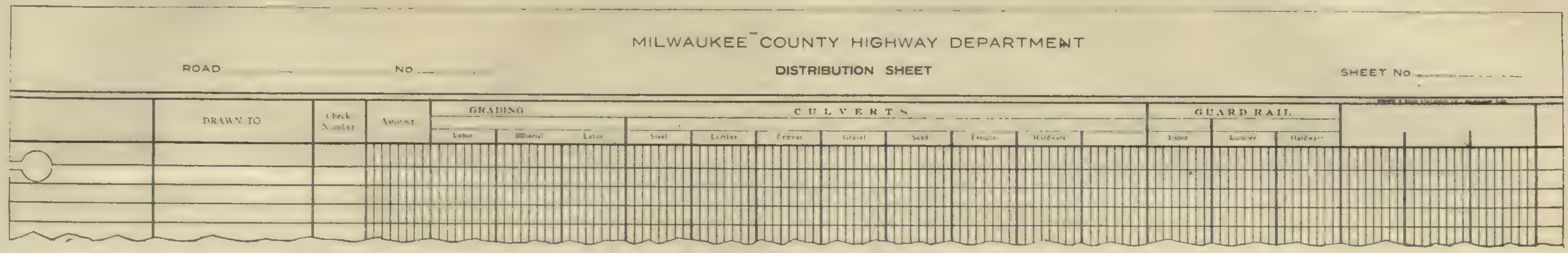
FIG. 7.—FORM FOR RECORDING RESULTS OF CEMENT TESTS.



MILWAUKEE COUNTY HIGHWAY DEPARTMENT
DISTRIBUTION SHEET
SHEET No ______
ROAD ______ No ______

	DRAWN TO	Check Number	AMOUNT	MATERIAL TO ROAD													LAYING CONCRETE		SHOULDERS		
					TRACTOR		UNCLASSIFIED		MATERIALS												
				Teams	Labor	Materials	Labor	Materials	Joints	Felt	Lumber	Cement	Gravel	Sand	Freight		Labor	Materials	Labor	Materials	

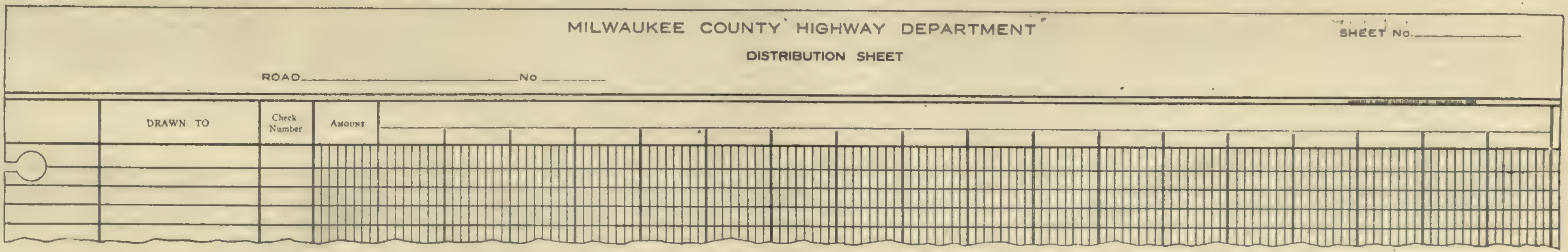
FIG. 8.—FORM FOR DISTRIBUTING COSTS.



MILWAUKEE COUNTY HIGHWAY DEPARTMENT
ROAD ______ NO ______
DISTRIBUTION SHEET
SHEET No ______

	DRAWN TO	Check Number	Amount	GRADING			CULVERTS								GUARD RAIL				
				Labor	Material	Labor	Steel	Lumber	Cement	Gravel	Sand	Freight	Hardware		Labor	Lumber	Hardware		

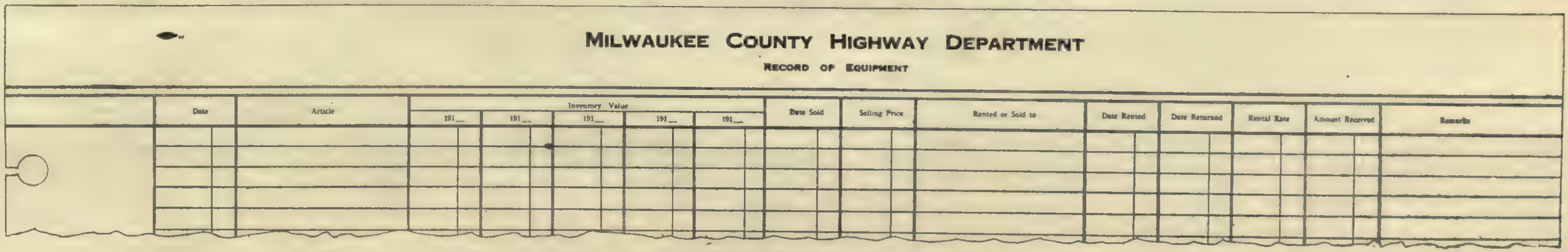
FIG. 9.—FORM FOR DISTRIBUTING COSTS.



MILWAUKEE COUNTY HIGHWAY DEPARTMENT
SHEET No. ______
DISTRIBUTION SHEET
ROAD ______ No ______

	DRAWN TO	Check Number	AMOUNT

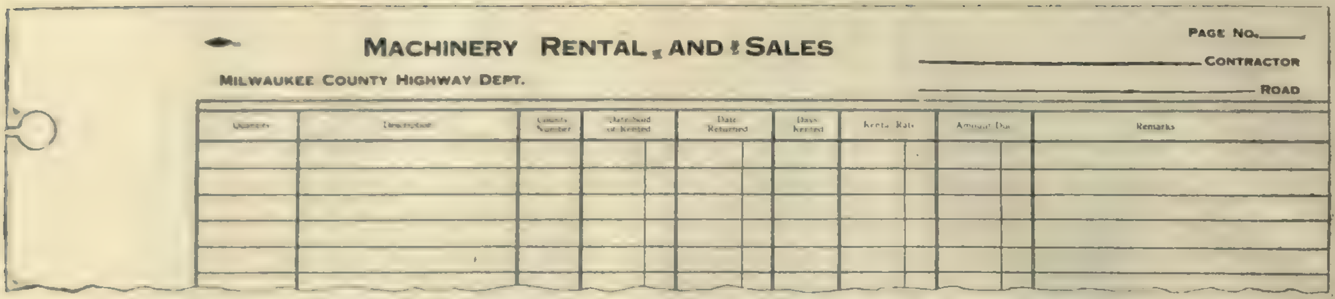
FIG. 10.—FORM FOR DISTRIBUTING COSTS.



MILWAUKEE COUNTY HIGHWAY DEPARTMENT
RECORD OF EQUIPMENT

	Date	Article	Inventory Value					Date Sold	Selling Price	Rented or Sold to	Date Rented	Date Returned	Rental Rate	Amount Received	Remarks
			191__	191__	191__	191__	191__								

FIG. 11.—FORM FOR KEEPING RECORDS OF COUNTY EQUIPMENT.



MACHINERY RENTAL AND SALES

PAGE NO.______

MILWAUKEE COUNTY HIGHWAY DEPT.

________________ CONTRACTOR

________________ ROAD

Quantity	Description	County Number	Date Sold or Rented	Date Returned	Days Rented	Rental Rate	Amount Due	Remarks

FIG. 12.—FORM FOR RECORDING RENTALS AND SALES OF EQUIPMENT.

record and the foreman's signature. One of these report cards is mailed to the department each day in a stamped envelope addressed to the County Highway Commissioner.

When these reports are received in the office of the department the information is taken off on the form shown in Fig. 4. This sheet is 19x16 in. in size. Payments are made on the 5th and 20th of each month.

Inspectors use the forms shown in Figs. 2 and 3, for construction work. These are printed on postal cards. The form shown in Fig. 2 is used for grading work and that shown in Fig 3 for concrete work. With the concrete work report, the inspector sends in tickets for all cement received on the job. This is required because, even on contract work, the county purchases all cement used. These reports, like the foremen's reports, are mailed daily to the office of the department.

A card index is kept of all cars of material, whether consigned to the department or to a contractor doing county work. This record enables the department to determine accurately the amount of material used on any job and to obtain any desired information about any car if its number or initials are known or if it be known where the material is going or where it came from. A record of the cars is kept on the form shown in Fig. 5. The sheet is 20 in. wide and 18 in. long, ruled in red and blue. The record of each job, of course, is kept on a separate sheet.

Cement tickets turned in by inspectors with their daily reports are entered on the form shown in Fig. 6. Amounts due cement dealers are determined from this record.

The large amount of cement used by the county has resulted in the keeping of a set of books for recording cement tests. Each car of cement is tested and the results recorded on the blank shown in Fig. 7. The blank is 19¾ in. wide and 9¼ in. long. While all the information provided for on the form is not secured for each car, the major portion of it is and sometimes all of it.

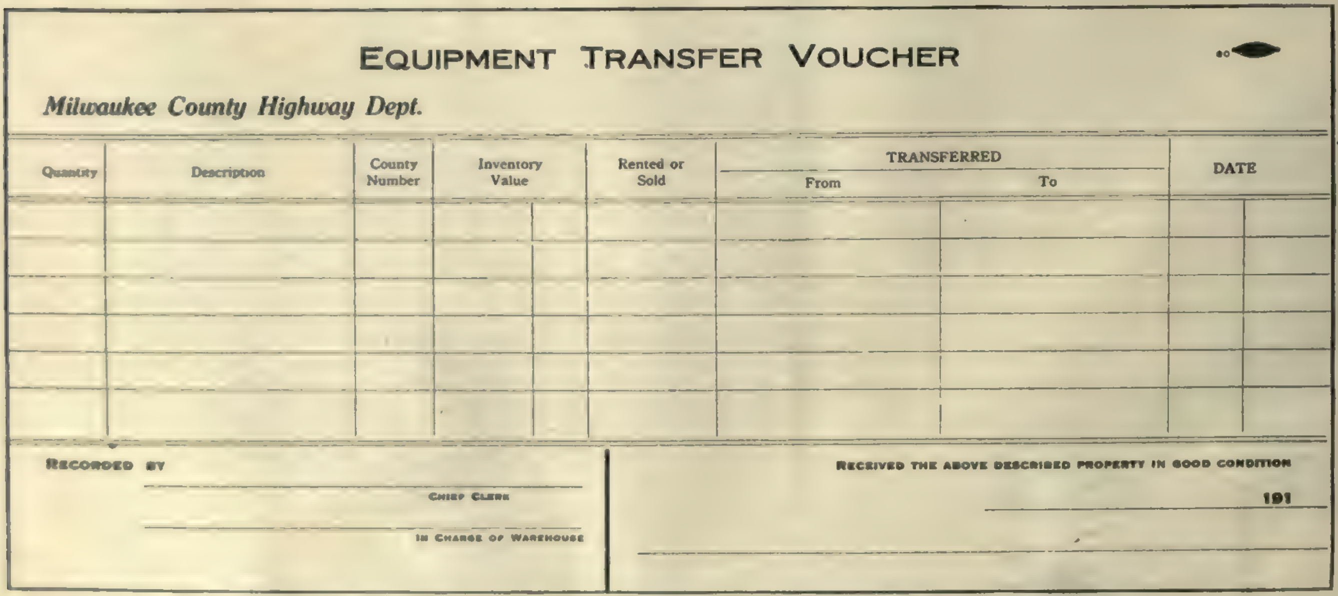
Orders for materials are given on a requisition form made out in triplicate. The form is 3⅝ in. wide and 8 in. long, printed in black on white paper. All orders must be given in writing and no payment of a bill is made unless the requisition for that particular purchase is shown.

A similar form is employed for transmitting orders to contractors. The blank is of the same size and shape as the requisition form but is printed on red paper. All orders must be given in writing and in triplicate and no orders to contractors are recognized unless given on this form.

In Figs. 8, 9 and 10 are shown the forms used for distributing accounts on the cost of work. These sheets facilitate the determination of unit prices over an entire job after the work has been completed and the units decided upon. The sheets are 24 in. wide and 12 in. long.

Figs. 11, 12 and 13 show the forms used for keeping account of the county's machinery and equipment. The man in charge of a shop or warehouse makes a duplicate record on the form shown in Fig. 13, sending the original to the department office and retaining the duplicate. From this voucher an entry is made on the form shown in Fig. 12 in order to make the proper charges against each contractor or foreman. In order to keep a record of the equipment itself, the information on the voucher is entered on the form shown in Fig. 11. These records show the location of all machinery and equipment owned by the county. The form shown in Fig. 13 is 3x4 in. in size; that in Fig. 12 is 15¾ in. wide and 10 in. long, and that shown in Fig. 11 is 24 in. wide and 12 in. long.

The Milwaukee County Highway Department maintains a laboratory in which a considerable amount of testing is done. Special forms are used for recording the results



EQUIPMENT TRANSFER VOUCHER

Milwaukee County Highway Dept.

Quantity	Description	County Number	Inventory Value	Rented or Sold	TRANSFERRED From	TRANSFERRED To	DATE

RECORDED BY

________________ CHIEF CLERK

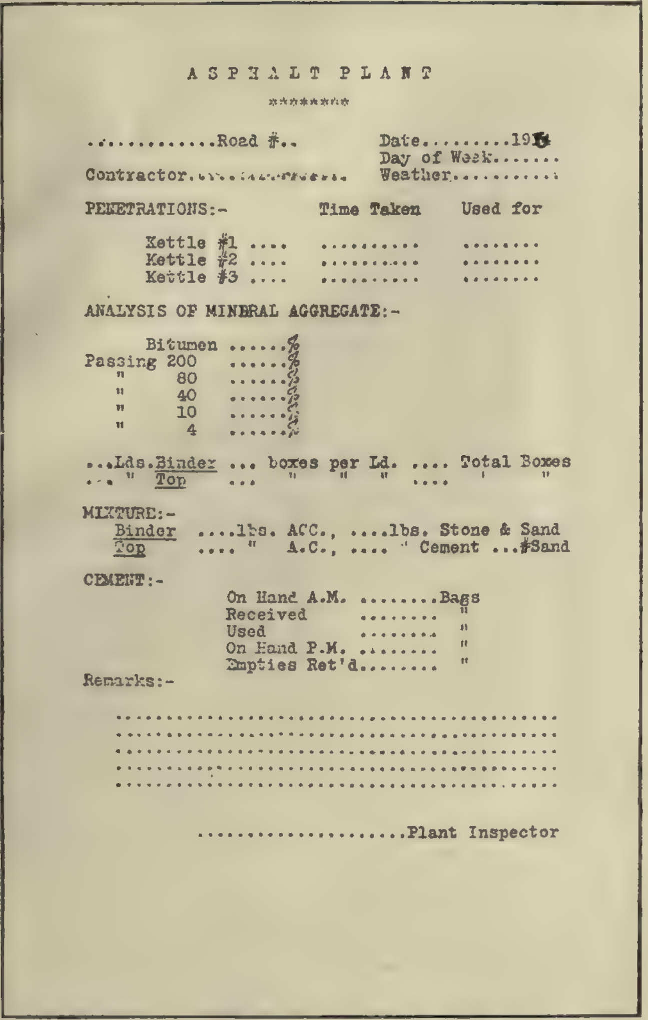
________________ IN CHARGE OF WAREHOUSE

RECEIVED THE ABOVE DESCRIBED PROPERTY IN GOOD CONDITION

________________ 191

____

FIG. 13.—FORM USED IN SHOPS AND WAREHOUSES FOR RECORDING EQUIPMENT TRANSFERS.



ASPHALT PLANT

****

.............Road #.. Date.........191
Day of Week.......
Contractor............ Weather..........

PENETRATIONS:- Time Taken Used for

Kettle #1 ....
Kettle #2 ....
Kettle #3 ....

ANALYSIS OF MINERAL AGGREGATE:-

Bitumen ......%
Passing 200 ......%
" 80 ......%
" 40 ......%
" 10 ......%
" 4 ......%

...Lds.Binder ... boxes per Ld. .... Total Boxes
... " Top ... " " " .... " "

MIXTURE:-
Binder ....lbs. ACC., ...lbs. Stone & Sand
Top .... " A.C., ... " Cement ...#Sand

CEMENT:-
On Hand A.M. ....Bags
Received .... "
Used .... "
On Hand P.M. .... "
Empties Ret'd........ "

Remarks:-

....
....
....
....
....

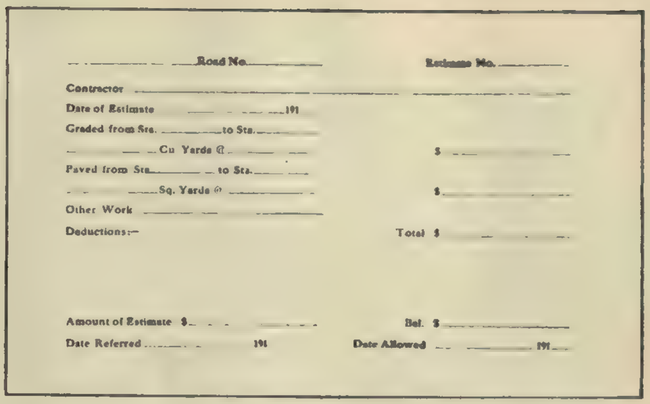
....................Plant Inspector

FIG. 14.—ASPHALT PLANT REPORT.

of tests on bituminous materials and of physical tests of cement. There is also a special form, shown in Fig. 14, for asphalt plant reports. This form is a card 6x8 in. in size.

Estimates to contractors for work done are made on the form shown in Fig. 15. This is a yellow card 5x3 in.

There is also a special form for the use of inspectors or foremen in turning in expense accounts.



Road No. ________ Estimate No. ________
Contractor ______________________
Date of Estimate ________ 191
Graded from Sta. ______ to Sta. ______
______ Cu Yards @ ______ $ ______
Paved from Sta ______ to Sta. ______
______ Sq. Yards @ ______ $ ______
Other Work ______________
Deductions:— Total $ ______

Amount of Estimate $ ______ Bal. $ ______
Date Referred ______ 191 Date Allowed ______ 191__

FIG. 15.—FORM FOR ESTIMATES TO CONTRACTS.

The form shown in Fig. 16 is not strictly an accounting form, but is of interest in connection with the systematic recording of data. It is the county's standard form of taking traffic counts and is self-explanatory. It is printed on a card 10¼x4¼ in. in size.

Effect of the War Upon Texas Road Work

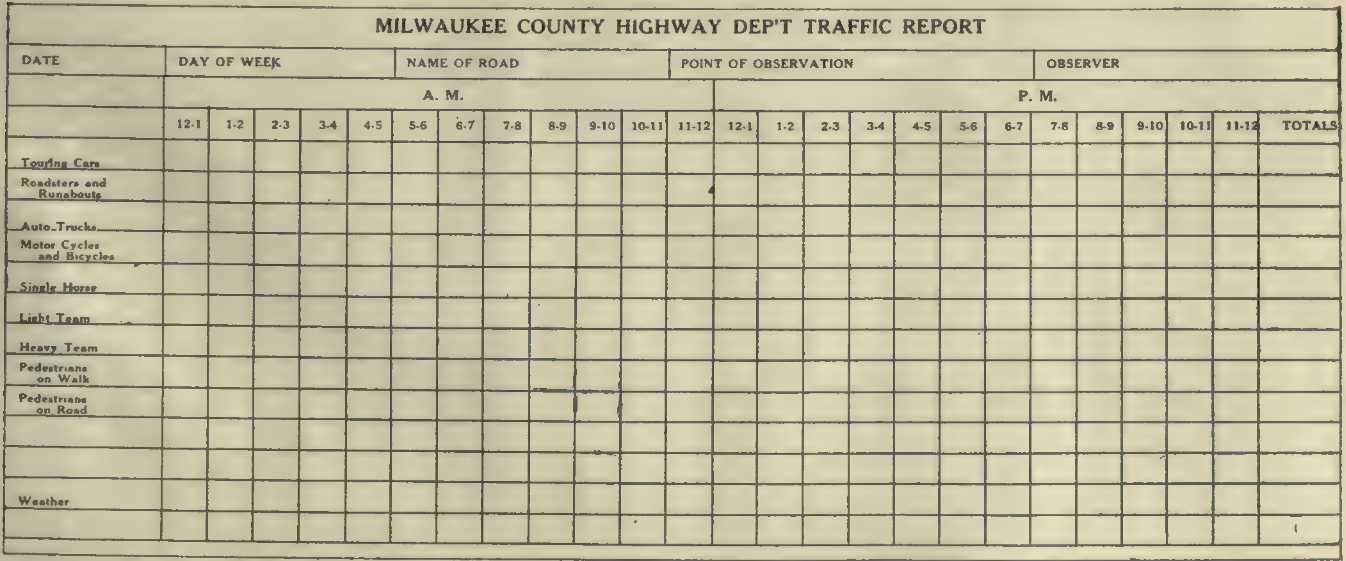
According to recent advices from State Highway Engineer Geo. A. Duren, of Texas, it is believed that the amount of road work done in that state during the present year will not be less than the amount performed last year.

There are available for road and bridge work during the current year state funds amounting to $280,000. With approximately $874,000 of federal funds this will make a total of about $1,154,000 available for construction. About $280,000 in addition will be expended for maintenance and construction.

Prison Labor in West Virginia Counties

The County Courts in West Virginia must provide equipment for working county jail prisoners on the roads, according to an opinion expressed by the State Road Commissioner. The decision was the result of a refusal on the part of the County Court of Wayne County to employ a road engineer or other official to direct the work of prisoners on roads in that county, and to assume any expense necessary for guarding the prisoners and transporting them.

Members of a county court refusing to provide for the working, safe keeping and transportation of prisoners between the prison and the place where the work is being done, are "deemed guilty of misconduct in office, and shall forfeit the office and be liable, upon conviction, to a fine of $50 to $200 and a jail sentence not to exceed six months."



MILWAUKEE COUNTY HIGHWAY DEP'T TRAFFIC REPORT																									
DATE	DAY OF WEEK					NAME OF ROAD						POINT OF OBSERVATION								OBSERVER					
	A. M.												P. M.												
	12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	TOTALS
Touring Cars																									
Roadsters and Runabouts																									
Auto Trucks																									
Motor Cycles and Bicycles																									
Single Horse																									
Light Team																									
Heavy Team																									
Pedestrians on Walk																									
Pedestrians on Road																									
Weather																									

FIG. 16.—TRAFFIC CENSUS FORM.

The New Highway Law of Illinois

Of the laws affecting highway work in the State of Illinois, passed by the last legislature, the most important and far reaching, if approved by the people at the November election of 1918, is the measure providing for the issuance of $60,000,000 of bonds for the construction of a state system of roads. Another measure provides for an increase in motor vehicle fees. Both the bond law and the motor tax law provide that the principal and interest of the bonds shall be paid from the motor fees, if a sufficient amount is available.

The new administrative code of the state went into effect July 1, as noted briefly in "Good Roads" for July 14. This consolidated into nine departments of state government the various commissions and boards under which the public affairs of the state had been administered. Highway work now comes under the Department of Public Works and Buildings, the actual work being in charge of the Superintendent of Highways who takes the place of the former commission. The chief engineer is retained with practically the same duties as under the former system. A highway advisory board consisting of five members is an added feature of road administration. No other changes are made in the organization of the highway department, and it is expected that it will continue in practically the same form. The personnel of the division of highways, including the bureau chiefs and division engineers and most of those holding subordinate positions, is also expected to remain practically as it was before the change. The superintendent of highways and the chief highway engineer receive salaries of $5,000 a year.

The civil administration law, in outlining the duties of advisory and non-executive boards of which the highway advisory board is one, says:

> Sec. 8. Each advisory and non-executive board, except as otherwise expressly provided in this act, shall, with respect to its field of work, or that of the department with which it is associated, have the following powers and duties:
>
> 1. To consider and study the entire field to advise the executive officers of the department upon their request; to recommend, on its own initiative, policies and practices, which recommendations the executive officers of the department shall duly consider, and to give advice or make recommendations to the Governor and the General Assembly when so requested, or on its own initiative;
>
> 2. To investigate the conduct of the work of the department with which it may be associated, and for this purpose to have access, at any time, to all books, papers, documents, and records pertaining or belonging thereto, and to require written or oral information from any officer or employee thereof.
>
> 3. To adopt rules, not inconsistent with law, for its internal control and management, a copy of which rules shall be filed with the director of the department with which such board is associated;
>
> 4. To hold meetings at such times and places as may be prescribed by the rules, not less frequently, however, than quarterly;
>
> 5. To act by a sub-committee, or by a majority of the board, if the rules so prescribe;
>
> 6. To keep minutes of the transactions of each session, regular or special, which shall be public records and filed with the director of the department;
>
> 7. To give notice to the Governor and to the director of the department with which it is associated of the time and place of every meeting, regular or special, and to permit the Governor and the director of the department to be present and to be heard upon any matter coming before such board.

The authority of the Department of Public Works and Buildings over highway work in Illinois is defined in the following language:

> The Department of Public Works and Buildings shall have power * * * to exercise the rights, powers and duties vested by law in the state highway department, the state highway commission, the chief state highway engineer, the assistant state highway engineer, and other officers and employees of the state highway service.

The $60,000,000 bond issue bill which will be submitted to the people of Illinois at the November election of 1918, is entitled "An act in relation to the construction by the state of Illnois of a state-wide system of durable hard-surfaced roads upon public highways of the state and the provisions of means for the payment of the cost thereof by an issue of bonds of the State of Illinois." In substance, it provides for the construction by the state, acting through its Department of Public Works and Buildings, subject to the Governor's approval, of a state-wide system of hard roads on routes described; for the control and maintenance, and for the conditional compensation for roads already paved, and gives such department full power to execute the act.

The law authorizes the state to contract a debt for the above purposes, and to issue $60,000,000 of serial bonds, bearing interest annually at not to exceed 4%, appropriating said sum to the uses of the department. It provides a tax levy sufficient to pay the interest on the amount annually, as it shall accrue, and to pay off the bonds within 20 years from issuance, but further provides that such payments may be made from other sources of revenue and requires that moneys in the Motor Vehicle Law "Road Fund," hereinafter referred to, be first used for such payments, the direct tax to be omitted in any year in which sufficient money from other sources of revenue has been appropriated to meet such payment for such year. It makes the provisions for the payment of such interest and bonds irrepealable, and pledges the faith of the state to the making of such payments.

As noted in a former issue ["Bond Issue and New Motor Law for Illinois," "Good Roads," July 7, 1917, p. 10], the money secured through the proposed bond issue is intended to build about 4,500 mi. of roads in the state.

The passage of the new motor vehicle law was a direct provision for taking up the $60,000,000 indebtedness of the people of the state. By its terms the revenue derived from motor license fees will eventually, as stated, be more than doubled. The new schedules of fees, to take effect Jan. 1, 1918, and Jan. 1, 1920, as compared with present rates, are shown in the following table from "Good Roads" of July 7:

Type of Vehicle.	Rates		
	1917.	1918.	1920.
Automobiles:			
10 hp.	$3.00	$4.50	$6.00
10-25 hp.	4.00	6.00	8.00
25-35 hp.	6.00	9.00	12.00
35-50 hp.	8.00	16.00	20.00
Over 50 hp.	10.00	20.00	25.00
Trucks:			
2-ton	5.00	10.00	12.00
Over 2-ton	10.00	20.00	25.00
Motorcycles	2.00	3.00	4.00

Through the passage of House Bill 578 an annual appropriation of $663,000 is made to what is known as the "Federal Aid Fund" for the purpose of meeting a similar apportionment from the United States Government under the federal aid road law.

Four other acts were passed revising the law in relation to roads and bridges. One of these provides that a county may accept and use any money turned over to it by a town or road district in the county, and the highway authorities of such town or road district are authorized to turn over to the county money from the permanent road fund or other available fund to be used in constructing a state aid road in such town or district under the direction of the state highway commission, the county board having authority to specify the roads to be improved, the type of improvements to be made, with other specifications, upon the approval of the state highway officials. The question of levying additional taxes or issuing bonds may be submitted.

The second bill provides for the construction or improvement by state aid of a road through any city, village or town of 2,500 inhabitants or less as a connecting link in a state aid road already improved or being improved to the corporate limits of such city, village or town, the width of road, materials used and the cost to be the same as provided for the portion outside of the corporate limits. By agreement between the state and the local officials, a road or street of a greater width may be built through a city, village or town, and of different materials, the city, village or town paying the additional cost, if any, and also the cost of maintenance within its corporate limits.

The third act provides that commissioners of highways may reduce the width of any existing public highway in any town or road district over which they have control, but no highway that has been laid out and dedicated to the public use and which has been set apart in any county by the proper authorities as a state aid road, shall be reduced in width without the consent in writing of the Department of Public Works and Buildings.

The remaining act relates to highway commissioners. The law formerly provided for three highway commissioners to serve for a period of three years. The present law requires that one highway commissioner shall be elected in townships, to serve for a period of two years. The commissioners of highways and two other persons to be named by the county board, shall be judges of all district elections. The commissioner of highways is vested with all duties and powers that formerly belonged to the commissioners. He receives a salary of $4 a day when employed in duties pertaining to the highways. The three commissioners formerly received $2 a day.

The Maintenance of Federal Aid Roads in Texas*

By **J. D. FAUNTLEROY**†

A very important feature of the federal aid road act is that requiring that the roads built under its provisions shall be adequately maintained, and if they are not maintained, then automatically federal aid will cease for that state or county, as the case may be.

Now, in my opinion, the maintenance of such roads is of more importance than the construction of additional new roads.

During the past five months engineers from our office have made inspections and prepared estimates of cost of improving roads in over 30 counties in Texas, and the information which we have gathered during this period has been enough to convince the most skeptical of the folly of issuing bonds to improve roads and then letting them go to pieces just for lack of adequate maintenance; so that, in many cases we have the sad spectacle before our eyes of communities being burdened with a bond issue which it will take 40 years to pay off, while the roads on which the money was spent are already worn out and gone.

Before building a road we should look ahead past the construction period to the maintenance which is to follow after, and endeavor to get a mental vision of how that road should look two or three or ten years hence. This is not a matter of mere conjecture, but, from information in hand, knowing the traffic that will traverse a road, we can determine, within reasonable limits, what the life of any particular class of road will be, and can also in like manner determine what the cost of maintaining that road should be. With such knowledge available it is criminal folly to go ahead and construct roads that will not answer the traffic requirements and that will either fail utterly, leaving only the debt to show that they were once constructed, or else they will have to be, at a future date, reconstructed at a much higher cost than would be the case had they been properly constructed of suitable materials in the first place.

In a new country like Texas we cannot definitely tell what the traffic on a road will be after improvement, for as soon as it is completed it seems, as if by magic, automobiles from all over the country at once learn of its location and seek it out. For example, when the post road between San Antonio and Austin was built, it was figured that 200 automobiles a day would be the maximum after the road was completed. As a matter of fact, during February of this year a traffic census was taken which showed that 931 cars per day was a fair average of the machines passing over this highway.

Therefore, in building a road upon which we have reason to believe there is even a prospect of a largely increased traffic, we should figure that the maintenance of this road will eventually be much more costly than it would be under ordinary conditions. In several cases of this kind here in Texas where we have had reason to believe that the normal traffic, upon completion, would not exceed a certain number of vehicles per day, we have recommended the construction of gravel roads; but, bearing in mind that with the development of the country there may be a large increase, we have also stated that the maintenance of these roads within a few years will probably involve the surface treatment of same with some kind of bituminous material.

In practically all of the counties for which we have prepared estimates of the cost of improving their roads, we have mapped out in detail what appeared to us to be adequate systems of maintaining these roads after they were constructed. These covered not only the amount of money to be appropriated each year for maintenance, but went into detail and prescribed the organizations to be employed.

For some of the larger counties we have recommended a county engineer, the dividing of the roads into sections to be kept up by patrolmen, adequate arrangements for dragging the roads, and for heavier work the employment of organized gangs provided with motor trucks.

For poorer counties we have recommended less elaborate systems, but in all cases we have endeavored to impress upon the people the importance of proper maintenance of their roads, and many of our reports will show we recommended that unless adequate arrangements were made for the proper maintenance of roads which it was proposed to build by the use of bond issue funds, no such bonds should be issued.

The question of maintenance is an old one. For the past 25 years different states have been experimenting and passing laws in the hope of successfully solving this problem. It cannot be said that any state so far has developed a perfect system of maintenance.

We know that in certain sections of a state, for example, the roads will be better maintained than in other sections, and the only way we can account for it is that in some counties the men in charge of the road work are more conscientious and develop more efficient methods than the road supervisors in other counties.

I know of a county in Texas not over a hundred miles from where we are now, which, without the aid of any bond issues, has succeeded in putting its main roads in very creditable condition, because its road overseers have tried honestly and faithfully to make every dollar go as far as possible, and have tried to handle the road business as though it were their own private enterprise.

---

*From a paper entitled "How the Federal Government Will Assist Texas Highways," presented at the mid-summer convention of the Texas Good Roads Association, Mineral Wells, Texas, June 20-22.

†District Engineer, Office of Public Roads and Rural Engineering, U. S. Department of Agriculture.

Very close to this county is another county, wherein all of the road funds have been expended, and over $100,000 of "anticipation warrants" have been issued for the purpose of road improvement and the roads are in a most wretched shape. This indicates indifference and neglect on the part of the officials of that county.

I do not know of any business wherein personal interest and intelligence will count for more than in the maintenance of rural roads.

Take, for example, the dragging of roads. Some men will take a road machine or a light drag and go out over a road during a rain, or immediately after it, and in the course of a few hours it will look splendidly, with the ditches cleaned out and the crown properly shaped. On the contrary, many men when employed to drag a road will defer this very necessary operation until the road is baked hard and dry and ruts are all over it, and as a result dragging is practically useless. You can put it down as a fact that when a man takes the seat off his wagon and places it on the road drag he is no good as a road man, and to anyone who really wants to see a road improved it is exasperating in the extreme to see such a man dragging the road with the horses going aimlessly ahead, while he dozes contentedly on his seat and perhaps smokes a pipe.

To properly handle a drag and get the best results, a man must be on the alert, stepping from one side of the drag to the other and occasionally getting off and even lifting one side of the drag in order that he may secure a proper crown to his road.

I once had a negro road machine man who could make a road look like a picture. On one occasion I instructed him to drag a piece of road and then went away. When I came back a few minutes later he was still standing where I had left him, looking up and down the road and making no effort to get started. I asked him rather sharply why he did not get busy and his reply was: "Boss, I'se jes' tryin' to get in my mind how dis here road gwine look after I done got fru wid it. Jes' as soon as I'se done satisfy myse'f how it gwine look, den I'se gwine start en de res' won' be no trouble." And he did make a fine job of that road.

Now it would be a splendid idea for more people to follow the plan of that ignorant negro and try to figure out how the road is going to look after they get through with it.

In New Hampshire, where they have very largely gravel roads subjected to a heavy automobile traffic, their patrol system has been very efficient, much more so than in a nearby and much richer state where politics have interfered more or less in the road management.

I know of many cases similar to the one described above where the present county funds not only suffice to maintain their roads, but the roads are being gradually improved all the time. I know of an eastern state wherein, by a system of careful maintenance, the unimproved state highways have been turned into very creditable roads, though no actual construction or reconstruction work has been done. This was done by cutting off a bump here, straightening out a sharp bend there, replacing temporary bridges with permanent drainage structures, and keeping the road well bedded up and thoroughly drained.

On the contrary, I know of a county in west Texas where a road needed only about a half day's work with a road machine to put it in good condition, and a number of road hands proceeded to plow up the entire road, thereby destroying the hard surface which the road had. The result of their three days' work was to utterly ruin one mile of road. It will take fully $500 to put this road back into proper shape.

I have tried to impress upon you the importance of intelligence and interest in road maintenance, and no system which you may devise is going to be a success unless the men who actually do the work are intelligent and conscientious.

There are many sections of roads in Texas that can be gradually turned into substantial highways by the gradual addition of sand, sand-clay, or clay, according as the roadbed is of clay or sand.

On all work where federal aid money is solicited we require resolutions from the local board stating that the road will be maintained, and when I have appeared before such boards and explained that such resolutions must be forthcoming, they have invariably answered me promptly that adequate financial arrangements would be made

I believe it is always better to have a clear understanding beforehand, rather than an unpleasant settlement afterwards, and for this reason I have asked these local boards in just what manner they were going to maintain these roads, and their answers have invariably been that the local road supervisor or road overseer would see that the roads were maintained. I have then asked them if this road overseer or road supervisor was a skilled man and if the roads under his charge at the present time were properly maintained. This latter question was generally a facer to them, and they had to acknowledge that their roads were not efficiently maintained. Then I have explained to them that the proper maintenance of a road means the providing of an adequate organization to maintain this road; that some man must be definitely responsible for the road at all times, and that it is much better to have one conscientious man devote his whole time to road work and to know that he has a sure means of livelihood so long as he performs his duties, than to spasmodically work the road with gangs of men who have little interest in such work.

I believe that the average intelligence of the country population in Texas is as high as it is in any state in the Union, and I am strongly of the opinion that if you place in charge of each improved road an intelligent laborer and let him understand that he is to devote his whole time to this road and is to keep it in good shape, you will be surprised at the excellent results which will be obtained.

From my own observations, which are borne out by the reports of the field engineers of our office, I am convinced that the present system of compulsory labor in Texas is 50% to 90% inefficient. Now this should be organized so that good results can be obtained, but undoubtedly in many counties strenuous methods will be necessary in order to secure the desired end. If I did not believe that some improvement over present methods could be effected, I would not hesitate to recommend to you right now the abolition of the compulsory labor system in this state; but I believe that by careful organization and laying out the work ahead, and placing all of this work under the direction of one man, good results can be obtained.

I would like very much to see the maintenance of all the roads in Texas placed upon a business basis. There is not a county in Texas so small or so poor that it is not able to employ either a county engineer or a competent road superintendent, who should have charge of the expenditure of all road and bridge funds in his county; and I am thoroughly convinced that the employment of such a man will be a splendid investment. When once the people are awake to the great benefit from having a system of properly maintained roads there will be no kick about the expense.

Illinois Highway Advisory Board Appointed by Governor Lowden

The five members of the Board of Highway Advisors which operates under the new law consolidating a number of state boards and departments in Illinois have been named by Gov. Lowden as follows:

Robert D. Clarke, of Peoria; Col. Wm. G. Edens, of Chicago; Homer J. Tice, of Greenview; Joseph M. Page, of Jerseyville, and A. R. Hall, of Decatur.

GOOD ROADS

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

JULY 28, 1917

RECORDING AND ACCOUNTING SYSTEMS FOR HIGHWAY WORK

Highway work furnishes one of the most striking illustrations of the rapid commercial and social progress of this country. During the past quarter century it has developed from a little appreciated side issue of community effort, carried on in a haphazard, unsystematic way, to one of the chief activities of government, involving annual expenditures of millions of dollars.

With this continuous growth in economic importance and the increasing variety and complexity of the problems on the technical side of the work, there has necessarily come a corresponding development in methods of administration, construction and financing. In many states highway work is now conducted along businesslike and scientific lines, although there are some states and smaller political subdivisions in which this particular branch of public work has lagged behind.

Perhaps the greatest advances in the entire field of road work have been made in the centralization of control, with the resulting uniformity in methods of carrying on the actual work of building and maintaining roads. Under the old system whereby every local unit was practically independent, little attempt was made to systematize work. With larger units and especially with the assumption of greater supervisory powers by the state governments there came the need far more systematic work and for complete, uniform records of expenditures and work done and planned.

It is natural that in those localities where large amounts of work have been done, there should have been evolved the most complete and detailed recording and accounting systems. One such system, that employed in Milwaukee County, Wisconsin, is described and illustrated in this issue, considerable space being given to reproductions of the forms used, since it is believed that more information can be given in that way than by even the most detailed printed description of the forms.

While records must always be kept a means to an end and not allowed to become an end in themselves, it may be well to lay some emphasis on their importance in road work. There are many communities where the taxpayers, because of lax methods of recording and accounting, have only the most general knowledge of what has been done with the money they have paid for road improvement. A not infrequent result of such conditions is the waste of funds year after year in careless, inefficient work. Another result of poorly kept records is an enormous loss of valuable technical knowledge. There are miles and miles of roads and pavements from which it would be possible for engineers to learn much to their advantage had anyone taken the trouble to keep complete records covering the methods and costs of construction and maintenance and to record traffic conditions.

The roads built in Milwaukee County have consisted very largely of cement concrete pavements and the recording system has, of course, been especially adapted to meet the requirements of that work. This, however, does not detract from the value of the general principles embodied nor preclude the possibility of gaining profitable information from a study of the system.

THE CARE OF SHOULDERS AND DITCHES

Earth roads constitute a very large portion of the highways outside of cities and towns, and except during the spring their roadbeds can be—and often are—kept in fairly good condition for motor traffic. But the traveled path is frequently so narrow that automobiles can pass only by turning out on the shoulders. For a long time after the roadbed has dried out in the spring or after rains these shoulders remain wet and spongy, an annoyance and often a danger to the occupants of cars.

Many of the roads on which these conditions prevail are not sufficiently important to justify widening the traveled path. The traffic is so small that a single-track road can be made to suffice, the money that widening would cost being thus made available for use on roads of greater importance. At the same time there are few roads so unimportant that it is justifiable to leave them in such condition that when two cars meet one of them must be backed to a place wide enough to allow the other to pass or else both must risk getting mired in attempting to pass.

The obvious remedy is taking proper care of the shoulders, but, in some sections at least, little attention is paid to that part of the road. If the roadway between the shoulders is in fairly good condition it appears to be considered enough. Rebuilding the shoulders with a material that drains quickly, shaping and clearing the ditches and providing whatever other drainage is necessary will remedy the condition. Even taking care of the drainage will greatly improve the road.

Motor-driven traffic more and more governs road construction and maintenance and the standards that sufficed for horse-drawn vehicles are no longer adequate. Motorists pay no inconsiderable part of the cost of road betterment and they are entitled to quite as much consideration as are the drivers of horses.

The First Link of the Proposed Highway from Joplin, Mo., to Miami, Okla., by way of Galena and Baxter Springs, Kan., is ready for inspection by federal engineers, according to report, the route between Joplin and Galena having been decided upon. This is the road for which Joplin has raised more than $100,000 by popular subscription. An effort will be made to have construction work started on this section of the road as soon as possible, and have it completed as far as Baxter Springs by fall. The money necessary for building the Kansas portion of the road must be raised by petition. Ottawa County, Oklahoma, in which Miami is situated, expects to vote on a $400,000 bond issue in the fall, which if carried, would supply the funds necessary to provide a hard-surfaced road to Picher on the state line.

Road Survey Methods of the Kentucky Department of Public Works*

Although it is not possible to establish any definite requirements, a few illustrations will be given of different conditions which may be met, with a suggestion concerning the amount of surveying which may be required.

1. When a survey is to be made in sidehill country it will be necessary to secure all data from which to figure all quantities required for the engineer's estimate, besides giving the state inspector the information necessary to enable him to direct the progress of the work. This applies to all new work whether following old roadbed or making a relocation. This will require a careful alignment survey and detailed cross-section and profile.

2. When a grading operation is contemplated and the amount of earth work is very light, which would mean a foot of excavation, or such would have to be made at different points or where slight elevations are to be moved to fill slight depressions nearby, and, if in the opinion of the engineer it would be advisable to receive bids on the mile basis, it may be necessary to supplement the line survey by only such staking as will serve to indicate the location and grade of the work to be done.

3. The least survey will probably be required when the work to be done consists of resurfacing a road which is already shaped and at the proper grade, and whose course is well defined. In this case, it may be necessary only to run such a general line survey and profile to show the existing grades and to secure such additional data as the width of the existing right of way, the width of the roadbed in cuts and on fills, and take occasional cross-sections to show the condition of present road. Also dig a few test pits to show thickness of stone and show condition of the culverts as will enable the commissioner to determine that the situation is such that state funds may be expended properly on the road.

4. On resurfacing work the engineer should at the outset send to the central office all information about drainage structures. Such procedure will allow designs to be made while the engineer is making surveys and maps, and when same are sent to the office the designs can be attached to plans, blue printed and contracts for everything let at one time.

Survey

The final location should be made in the field and not on paper and sufficient data must be secured to enable the computation of all quantities, and such stakes should be set as will be necessary for the state inspector in giving all the lines and grades which will be necessary during construction.

Survey should consist of the running of the center line, marking the location of the necessary objects along the road, and setting the stakes and marking to designate line and grade; running levels and taking cross-sections; and securing such information on bridges and culverts and the general drainage situation as may be required.

Survey Line

The final survey line is to be the actual construction center. If preliminary lines are necessary the center line is to be located after plans are drawn. The angle points should, if possible, be located on the nearest 0.1 ft. marks and the deflection angle for each course should be measured to the nearest minute and the magnetic bearing of each course must be taken and indicated on the plans. Every angle point should be referenced in with three ties to permanent objects unless the courses are very short. All curves should be run in the field at the time of making location. On resurfacing work it is not necessary to run curves but angle points should be referenced about every 1,000 ft.

Side Locations

In general a tape survey will give the necessary accuracy in making locations. All significant objects within a hundred feet or so of the finished road should be indicated, but where they are at a greater distance the dimensions, etc., may be estimated. Whenever the position of an object becomes important (as for instance when a stream nears the road embankment or when a house is situated close to a road whose grade it is planned to change to a marked degree) locations should be made to the nearest foot.

Offsets from the survey line to the bordering fences or walls should be made every 100 ft. or oftener if the irregularities so require; dividing property fences should be located by offsets from the center line, but the direction may be satisfactorily indicated by determining their range intersection with the base line; and when it becomes necessary to locate buildings or other objects accurately it will be sufficient to determine their range on the base line and their rectangular dimensions. Location of materials, quarries, gravel beds, etc., should be taken and it should also be noted where water may be obtained for sprinkling the roads.

Alternative Lines

In case the engineer is undecided which of two possible relocation lines should be followed, he should run a line from each location, these lines to be designated "Line A" and "Line B." Profiles and cross-sections should be taken along each line and plans of both submitted to the state office with reasons for selection of the route adopted and an estimate of the cost of each also to be furnished.

Alternative lines should be made on separate sheets.

Levels

Profile levels should be taken at least 300 ft. beyond the beginning and end of the proposed road.

A well adjusted transit bubble will be sufficiently accurate for general highway work where a closing error of 0.1 ft. per mi. will be allowed.

Levels should be run forward and backward along the course of the road in order to close the circuit. Bench marks on some prominent object should be taken at intervals of each ¼ mi. and recorded in the notes.

The profile levels of the center line and bench marks should be run in one operation and check levels run in the same operation with the cross-sections, but do not attempt to do both at one operation.

It is not necessary to run check levels on resurfacing work.

Cross-sections

Cross-sections should be taken at all 100-ft. stations in regular country and at shorter intervals where the ground undergoes a marked change between stations. Where rock is encountered, sections and sounding to determine the elevation of the rock should be taken at such frequent intervals as the surface requires.

At the station points, readings should be taken on the center line of the traveled way, the right and left edges of the traveled way or of the roadway, at the top and base of each slope and one reading farther out (not less than

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*From "Instructions to Engineers Making Road Surveys," Bulletin No. 9, Kentucky Department of Public Roads. Besides the extracts printed here, this bulletin contains detailed instructions for making reports on proposed drainage structures, for reporting on inspections of bridges and culverts, for reporting on materials, for drawing plans and preparing estimates.

30 ft. from the center line of location) at either side to show the slope of the natural surface.

Readings on the ground should be taken to the nearest 0.1 ft.

In general it will not be necessary to show more of the topography than these cross-sections will reveal. In cases where the location of the road is open for some question, a short topographic survey might be made in order to show on the plans the circumstances which caused the choice of the location to be made.

Take only a few cross-sections to show condition of road on resurfacing work.

Drainage

Complete provisions must be made for the drainage of every road and the plans must show what arrangements have been made and complete data must be furnished for all drainage structures larger than regular standard culverts. Estimates of the drainage area for all structures must be given in all cases.

For culverts the length, width and average slope per 100 ft. of drainage area should be noted and the direction of flow indicated on plan by an arrow.

Ditches

Whenever the road is at a grade of less than 0.5%, the grading of the drainage ditches must be planned by a separate grade. The design of the ditch must be shown on the cross-sections, and all grades of less than 0.5% should be avoided if possible.

Underdrains

The engineer should take special care to note or to determine by local inquiry any parts of the road which break up in wet seasons, and specify underdrains.

Culverts

Pipe culverts crossing the center line of the road should not be less than 22 ft. long.

Every bridge and culvert within the course of the design should be described in the specified form whether it is or is not intended for reconstruction.

At every culvert which it is proposed to construct or reconstruct, a cross-section should be taken along the proposed axis, and the section taken far enough out to show elevation of inlet and the lowest possible outlet available, even if this involves the construction of a short ditch.

Profiles must also be taken on the center line of the road, the elevation of the finished roadway noted, and, if the culvert is to be located on a skew, the angle of the skew must be given. Do not try to build culverts at right angles to the road if same should be built on a skew to fit the stream.

Considerable attention should be paid to the angle at which any drainage structure crosses the road, and if it should be built on a skew, the angle must be noted and the length and type of wings should be noted in every instance. Culverts should not be designed askew if possible to economically change the course of stream.

Bridges

When it is proposed to build a new structure a profile must be taken along the center of the road, the elevation of the bed of the stream must be shown and high water mark, the elevation of the proposed finished road indicated, the class of foundation material noted and depth to the various classes of material. Recommendations as regards wings must be made, that is length and type. All the above information must be shown on a sheet and it may be possible that four or five of such can be placed on one of the standard sheets. It will also be necessary to fill in a bridge inspection report for each structure, but the profile may be omitted on the inspection report.

Staking Out

The inspector will give the necessary lines and grades needed for construction if the road is staked at the time of the survey, in accordance with the following directions. If there is any doubt about the suitability of a different method of staking out, the engineer should communicate with the deparment and receive instructions before proceeding.

Reference stakes must be driven along both sides of the road opposite the 100-ft. stations and at the angle points, preferably at the fence lines. These stakes should be faced parallel to the center line, and angle stakes should be parallel to the course whose termination they mark, and the above stakes must be set and set far enough so that they will not be disturbed during construction or be disturbed in any other way.

For resurfacing work a single line of stakes will be satisfactory.

The distance to the center line must be shown to the nearest 0.1 ft. on the back of the stake, and the station number marked on the face of the stake which faces toward the center line of the road.

Levels at the center line are to be taken on the ground opposite all these stakes as well as at the reference stakes, and the distance from the center line to the reference stakes is to be recorded in the notes in order that after the design of the road has been completed the surveyor may fill out a grade sheet on which there is shown for each stake the distance to the center line and the cut or fill of the center line at that point.

It is evident from the foregoing that readings must be taken on the ground at the stakes.

The stakes which are to be used should be sharpened 24x2x1-in. sticks with two planed surfaces. Markings on stake should be made with some weather-proof crayon.

For convenience in transferring levels from the reference stakes to the center line of the road during construction, inspectors will be required to equip themselves with the "Stevens Line Level," which may be had from the Frank B. Hall Company, Newton Falls, Ohio, at a cost of 50 ct., or some other equally efficient leveling device.

Inspectors will also be required to equip themselves with a 50-ft. "metallic" engineer's tape graduated in feet and tenths of feet.

Clam Shell Road Building

The road from Anahuac to White's Bayou in Chambers County, Texas, is being improved by the use of clam shells obtained from the banks of Turtle Bayou, an inlet of Trinity Bay. The work is in charge of the county supervisors, and is being done by day labor. A report of the operations gives the following data concerning equipment used, the method of construction, and the cost.

The shell is hauled a distance of about 3 mi. Eighteen wagons, each carrying about 6½ yd. of shell per day, are engaged upon this work, while 6 men are required for loading the wagons. The material is unloaded and spread by two men.

A firm, dry foundation is first prepared, the shoulders being formed by the use of a grader. The shell is laid upon this foundation to a depth of 8 in. and over a width of 8 ft., 1 cu. yd. of shell making about 4 lin. ft. of road. When the placing and spreading of the shell is completed, it is firmly packed. For this purpose a tractor is used, the edges of the road being at the same time shaped up by a grader attached to the tractor.

Wagons and teams for hauling the material are supplied by the citizens. The county pays the expense of feeding the teams. The haulers receive $1.75 per day, and the loaders, $2 per day. On a basis of 6½ yd. of shell hauled by one wagon per day, the cost amounts to about 75 ct. per yd.

The Board of Freeholders of Essex County, New Jersey, has authorized a bond issue of $500,000 for park extensions and improvements.

Case of Motor Tax Law in Texas Courts

The suit of P. S. Atkins against Curtis Hancock, Chairman, and other members of the State Highway Commission of Texas, which as noted in a former issue ["Test of New Motor Tax Law in Texas," "Good Roads," July 14, p. 16] was brought to test the constitutionality of the highway commission law, is now before the higher court.

The particular point involved in this suit is the validity of that provision of the law which imposes a registration fee or license tax on automobiles and other vehicles. Judge George Calhoun of the District Court, before whom the suit was brought, has rendered a decision refusing to grant an injunction to the plaintiff to restrain the collection of the license tax. An appeal was taken to the Court of Civil Appeals.

Judge Calhoun held that in passing this law the legislature acted within its legislative powers and that there is nothing in the act repugnant to the constitution; that it is one of the functions of the government to establish and maintain public roads, "and that over said roads the state by and through the legislature has absolute control," and may rightfully prescribe uniform regulations necessary for public safety and also charge a graduated fee for the registration of motor vehicles. The court held also that the legislature was acting within the police power of the state in the enactment of the law.

Extensive Highway Improvements in Pennsylvania

State Highway Commissioner Black will open bids on August 7 for the construction of improved highways in Cambria, Allegheny, Washington, Lehigh, Butler, Lackwanna, Luzerne and Dauphin Counties.

In order to give contractors a better opportunity to handle the work the road to be improved in Cambria County has been divided into three sections. The first section is in East Taylor Township and is 9,870 ft. in length. The second section is in Jackson and East Taylor Townships and is 11,070 ft. in length. The third section is in Jackson Township and is 11,975 ft. long. The entire road is to be 16 ft. wide and of the vitrified block type of construction. It is located on State Highway Route 52.

The Pittsburgh Pike, which is to be improved, is divided into two sections: The Washington County section is 19,318 ft. long, located in Cecil and North Strabane Townships, while the Allegheny County portion road is 16,852 ft. long, located in South Fayette Township. This road, which is on State Highway Route 108, is to be of reinforced concrete and vitrified block construction and the pavement is to be 16 ft. wide. Another road to be improved in Washington County commences at Centerville and extends through East Bethlehem Township to Millsboro, over State Highway Route 268. This pavement is to be 16 ft. wide and is to be constructed of reinforced concrete and vitrified block. It is understood that the East Bethlehem Township commissioners will bid on this section of roadway, which is to be 15,379 ft. in length.

The Lehigh County road is located in Hanover Township, on State Highway Route 159. The pavement is to be 16 to 20 ft. wide, 11,870 ft long, and of reinforced concrete construction.

In Butler County the road to be improved is located in Clinton Township, on Bureau of Township Highways Authorization 319. This is to be a vitrified block pavement 16 ft. wide and 5,800 ft. long.

The Lackawanna County road is in South Abington Township, on State Highway Route Number 9. It is to be 18 ft. wide and 7,821 ft. long, and of bituminous construction.

Luzerne County's road is in Shickshinny Borough, State Aid Application 583. This is to be a vitrified block pavement 16 to 30 ft. wide and 6,285 ft. long, while the Dauphin County road which is in Swatara Township, is 26 ft. wide and 1,270 ft. long, also of the vitrified block type of construction.

Bids for the construction of improved roads in Clarion, McKean, Somerset, Center, Venango and Beaver Counties, Pennsylvania, will be opened by State Highway Commissioner Black on August 14. The location and the length of the road to be improved in each county, with the type of construction, are as follows:

Clarion County: Commencing at the Clarion Borough line and extending through Clarion and Paint Townships, over State Highway Route 65; 14,128 ft.; vitrified block, 16 ft. wide.

McKean County: Wetmore Township, commencing at the Kane Borough line and extending to Kanesholm, over State Highway Route 95; 21,101 ft.; vitrified block, 16 ft. wide.

Somerset County: Extending from an improved road southeast of Somerset, to the Listele Road, through Somerset Township, State Aid Application 364; 6,675 ft.; vitrified block, 16 ft. wide.

Center County: On Water and Willowbank Sts., Bellefonte, State Aid Application 456; 2,454 ft.; vitrified block, 16 to 20 ft. wide.

Venango County: Cornplanter Township, State Aid Application 681; extending from Oil City to Rouseville; 7,857 ft.; vitrified block, 16 ft. wide.

Beaver County: Extending from College Hill Borough to the Lawrence County line, over State Highway Route 77; 23,546 ft.; reinforced concrete, 16 ft. wide.

Mexico's Policy of Road Construction

The Mexican Government has committed itself to the policy of constructing at the earliest possible time a system of modern highways to connect all of the principal cities and ports of the country. This movement was inaugurated several weeks ago by the Department of Communications and Public Works, following the outlining of the tentative plan for construction and improvement of the highways of the country.

There was held in the City of Mexico a meeting of good roads enthusiasts from different parts of the country. This meeting has resulted in the organization of the National Highway Association of Mexico. The honorary president of the association is President Venustiano Carranza. The secretary is Jose H. Delgardo, who holds the position of Mexican consul at Nogales, Ariz.

The tentative plans call for the construction of several trunk highways, the first to run from the capital to Tepic on the west side via Guadalajara, thence up the coast to Guaymas, thence north to Nogales. This proposed highway is approximately 1,200 mi. long. It will parallel the Southern Pacific Railroad of Mexico all the way from Tepic to Nogales, a distance of about 800 mi. Branching off from this trunk highway will be a number of modern roads extending to towns and mining camps.

The second proposed highway which is to be built under the direction of the National Highway Association of Mexico with the financial assistance of the federal government and the different states along the proposed route is to run from the City of Mexico to Laredo on the Rio Grande border, a distance of about 800 mi. A branch of this road will be built from Monterey to Torreon and from Torreon north to Eagle Pass and south from Torreon to Durango. This second highway will be routed through Toluca, San Luis Potosi, Saltillo, Monterey and a number of smaller towns. It is also proposed to build a modern highway to run from the City of Mexico to Vera Cruz, following the ancient highway that was built by Cortez about 400 years ago. There are still remnants existing of other ancient highways which were built during the days of the Conquistadores and wherever it is possible these old main highways will be rehabilitated and put to modern use. The fact that there have been imported to Mexico during the last two months through the ports of entry of Nogales, Agua Prieto, El Paso, Eagle Pass, Laredo and Brownsville and other small international gateways more than 5,000 automobiles, is serving as a stimulus for the good roads movement.

Traffic Census in New York City

A census of vehicular traffic in New York City has been completed by the Fifth Avenue Association. The point at which the census was taken is Fifth Ave. and 42d St., the heaviest traffic center in the United States. The avenue is 55 ft. wide at this point, and theoretically accommodates six lines of vehicles.

A count was made of vehicles of all kinds passing the public library, between 41st and 42d Sts., from 8 a. m. to 6 p. m., 16,960 vehicles having passed during the period of 10 hours, or an average of 28 vehicles per minute. The traffic was about evenly divided between northbound and southbound vehicles, there being 8,513 of the former and 8,447 of the latter. The total volume of traffic included 1,296 motor buses, numbering about 130 per hour in both directions. Passenger motor vehicles composed about two-thirds of the traffic, and these included the motor buses which are heavier than most commercial cars.

The pavement carrying this enormous weight as well as volume of traffic, as pointed out by the association, is of interest. The type of construction is sheet asphalt, 1½-in. close binder and 1½-in. top, on a 6-in. concrete base. It was laid in 1913, replacing a similar pavement which was 17 years old when relaid. The analysis of the top mixture used in this pavement shows a high percentage of bitumen and a correspondingly high proportion of fine material. An average of 11.7% of Trinidad asphalt was maintained throughout the laying of the pavement, although 10.5% was all that was required. The complete analysis of the surface mixture is as follows, the standard being given for comparison with the actual composition of the Fifth Avenue pavement:

	Standard	Fifth Avenue
Asphalt	10.5%	11.7%
200 mesh	13	17.3
100 "	13	10
80 "	13	22
50 "	24	23
40 "	11	5
30 "	8	8
20 "	5	2
10 "	8	1

The box measurements for the top mixture were 720 lb. of sand, 105 lb. of dust, and 175 lb. of asphalt cement. For the binder course the measurements were 600 lb. of stone, 310 lb. of sand and 90 lb. of asphalt cement.

Automobile Registrations, Licenses and Revenues in the United States in 1916

The Division of Road Economics of the U. S. Office of PublicPublic Roads and Rural Engineering has prepared a circular, as noted in the issue of July 21, on the above named subject. It shows an increase in motor cars registered in the United States during 1916 of 1,067,332 over the previous year, or 43%. This increase corresponds closely with the annual percentage increase of registration of the last three years, which has averaged 40% in the number of cars and 50% in revenues.

Registered cars, including commercial cars, reached in 1916 a gross total of 3,512,996; the number of motorcycles registered was 250,820.

Registration and license fees, including those of chauffeurs and operators, collected by the various states produced a total gross revenue of $25,865,369.75. Of this amount 92%, or $23,910,811, according to the circular referred to, was used for the construction, improvement, or maintenance of public roads in 43 states.

Figures covering a period of years show a remarkable increase in motor car registration and gross revenue. In 1906 only 48,000 cars were registered, and a total gross revenue of about $193,000 collected, only a small portion of the amount being applied to road work. In 1916, according to the report, an amount equal to about 9% of the total rural road and bridge revenues was applied directly to road improvement. It is stated that about 70% of the total amount used on road work was administered under the control or supervision of the state highway departments.

Urge Purchase of Another Toll Road in Pennsylvania

A number of citizens from Franklin, Adams and Fulton Counties, Pennsylvania, have held a conference with State Highway Commissioner Black looking toward the possible purchase by the state of the Waynesboro, Greencastle and Mercersburg Toll Road.

This turnpike leaves the Lincoln Highway at McConnellsburg and extends through Mercersburg, Greencastle and Waynesboro to the Maryland state line. Thirty-two miles of the road are located in Franklin County, 6 mi. in Adams County, and 3 mi. in Fulton County. The highway was formerly known as the Baltimore and Pittsburgh Turnpike.

The Commissioners of Franklin and Adams Counties, who were represented at the conference, agreed to pay one-half of the cost of freeing the road. It is believed that the Fulton County Commissioners will also join in the expense.

The date named for inspecting the road was the 27th.

The delegation was composed of John C. Metcalfe, Walter Bryon and Dr. John L. Bradley, of Mercersburg; William Patton, of Greencastle; J. C. F. Groh, Ezra Frick, Edward Beck and Elmer Frantz, of Waynesboro; E. C. Keefer, of York Springs, County Commissioner from Adams; Amos Welker, of Willow Hill, and Ross S. Gordon, Commissioners of Franklin County.

General Highway Appropriation Bill Approved by Governor of Pennsylvania

The highway appropriation bill providing $10,373,470 for road purposes in Pennsylvania has been signed by Governor Brumbaugh, the only change made being in the item of $2,000,000, the state's share of the expense of state aid highway work done under the law of 1911. This was reduced to $1,500,000.

The appropriations as they stand at present are: For construction of state highways, $6,000,000; for the purchase of toll roads, $500,000; appropriation for roads constructed in townships, $1,873,470, and the state aid item referred to.

NEWS NOTES

Fifteen Forest Road Projects in the State of Oregon have been approved by the Secretary of Agriculture. The cooperative work on these roads involves the expenditure of $2,228,388, half of which is federal money.

A Parallel Road System providing two continuous highway routes between New York City and Buffalo, N. Y., passing through the centers of population, is the plan of the New York State Highway Commission, according to a report.

A Map of the State Highway System of South Carolina, as designated by the State Highway Commission has been prepared by the engineers of the department. The system comprises 2,515 mi. of roads connecting all county seats in the state. The time required for the building of the system is estimated at 10 years.

MEETINGS

Calendar of Coming Meetings

August 15-17.—League of Wisconsin Municipalities.—Annual convention, Racine, Wis. Secretary, Ford W. MacGregor, Madison, Wis.

August 22.—Union of New Brunswick Municipalities.—Annual convention, St. John, N. B. Secretary, James King Kelley, St. John, N. B.

August 27-29.—Union of Canadian Municipalities.—Annual convention, London, Ont. Secretary, W. D. Lighthall, K.C., Westmount, P. Q.

Aug. 29-31.—Ontario Municipal Association.—Annual convention, Toronto, Ont. Secretary, B. H. Spence, 705 Lumsden Building, Toronto, Ont.

Sept. 5-8.—League of American Municipalities.—Annual convention, Gary, Ind. Secretary, Robert E. Lee, City Hall, Baltimore, Md.

Pikes Peak Ocean to Ocean Highway Association

At the midsummer meeting of the Pikes Peak Ocean to Ocean Highway Association at Colorado Springs, July 10-11, resolutions were passed urging uniformty of legislation affecting highways and automobile traffic, in harmony with federal legislation, as an aid to highway development. The organization of the New Jersey division which provides the highway with two eastern termini, one at Philadelphia and one at New York, was reported by the Committee on Eastern Extension. The closing session of the convention was held on the summit of Pikes Peak which the delegates reached by way of the new automobile road.

Montana Highway Builders Meet

A five-days' conference for the discussion of practical road problems in Montana was opened at Butte on July 14 under the auspices of the State Highway Commission. Almost every county in the state was represented by road supervisors and road builders. Chairman Horne of the commission, who conducted the meeting, expressed the hope that the intensive study of the subject which was being made would be reflected in the future roads of the state. A large portion of the time devoted to the conference was taken up in inspecting the state's highways, tours of personal observation being made from Boulder, the headquarters of the meeting for four days.

PERSONAL NOTES

Philip Guise has been appointed County Engineer of Sussex County, New Jersey, succeeding Harvey Snook.

F. S. Krug, City Engineer of Cincinnati, Ohio, has been appointed Chief Engineer of the Rapid Transit Commission.

Charles E. Fowler, consulting bridge engineer of Seattle, Wash., has opened offices in the Woolworth Building, New York City.

Frank S. Peck, of Deadwood, has been appointed State Highway Engineer of South Dakota by Governor Norbeck. His appointment is in conformity to the new law creating a state highway commission, which requires that the third member of the commission, shall be a civil engineer experienced in road building. Mr. Peck has been identified with highway projects in the state, having had charge of the building of the improved roads through the Black Hills.

Harvey Snook, until recently County Engineer of Sussex County, New Jersey, has been called to military duty as a lieutenant in the United States Army.

H. F. Shipley has been appointed Assistant Engineer in the Engineering Department of the City of Cincinnati, Ohio, to have charge of highways and structures.

R. L. Kenan, until recently County Engineer of Chilton County, Alabama, has joined with Fulton Pace in the practice of consulting civil engineers, specializing on federal aid highway projects.

R. Keith Compton, chairman of the Baltimore, Md., Paving Commisson, has been commissioned a major in the Engineers Officers' Reserve Corps and has been summoned to Camp Meade at Admiral, Md. He will not take an active part in the affairs of the commission until the close of the war. The department will be in charge of Frank K. Duncan, Principal Assistant Engineer.

R. H. H. Spidel, formerly Bridge Engineer of the State Highway Department of Ohio, and at present Highway Bridge Engineer of the United States Office of Public Roads and Rural Engineering, has been assigned to work in connection with the construction of an extension to a concrete bridge across the Gila River at Florence, Ariz. This is a federal aid project which is being carried out under the direction of the state engineer, at an estimated cost of $110,000.

NEWS NOTES

Laborers on the Roads of Fayette County, Kentucky, have received an advance in maximum wage to $2 a day by order of the Fiscal Court.

The Beginning of Construction Work on the Dixie Highway in Butler County, Ohio, was recognized by a celebration attended by citizens of the county.

A Spiral Approach to Minimize the Cost of Land and condemnation of private property is a feature of the plan for the proposed bridge over the Delaware River between Camden, N. J., and Philadelphia, Pa.

"To Samuel Hill, Road Builder," is the suggested inscription on a monument which, according to report, will be proposed in honor of the man whose efforts mainly secured the construction of the Columbia River Highway.

A Survey of the Road System of Delaware has been ordered by the State Highway Commission to facilitate the building of highways. A corps of engineers under the direction of the Chief Engineer will be employed for the work.

Road Building Contracts in Cook County, Illinois, call for concrete construction amounting to $120,964.94. The work on Section P will be done by the Chicago Heights Construction Co., and on Section Q, by Connelly & Dunning, of Chicago.

The Unveiling of the Earle Monument erected by the West Michigan Pike Association and other friends of the good roads movement at the site of the first mile of road built in Michigan under the state aid plan, will take place at Cass City, Mich., on Friday, Aug. 24, at 1 p. m. The monument is in honor of Horatio S. Earle, road pioneer and former State Highway Commissioner.

The Use of an Appliance for Dimming the Headlights on motor vehicles when approaching other vehicles is a requirement of new legislation in New Brunswick. The method of assessment prescribed for such vehicles is changed from horse power to weight, as follows: Automobile, $0.60 per cwt.; motor trucks not exceeding two tons, $10, with $5 per ton or fraction thereof over 2 tons; motorcycles, $3.

An Organization Consisting of Four Citizens of Elkhart, Ind., to construct new roads into the city was formed recently under the name of the Osolo Construction Co. They were awarded the contract for improving the Adamsville Road for a distance of 4¼ mi., after unsuccessful efforts were made in May and June to secure bidders. The bid of the Osolo Co. was $12,750, or about $3,000 per mi., and it is stated that a good road will be built for the stipulated amount.

GOOD ROADS

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Number 5

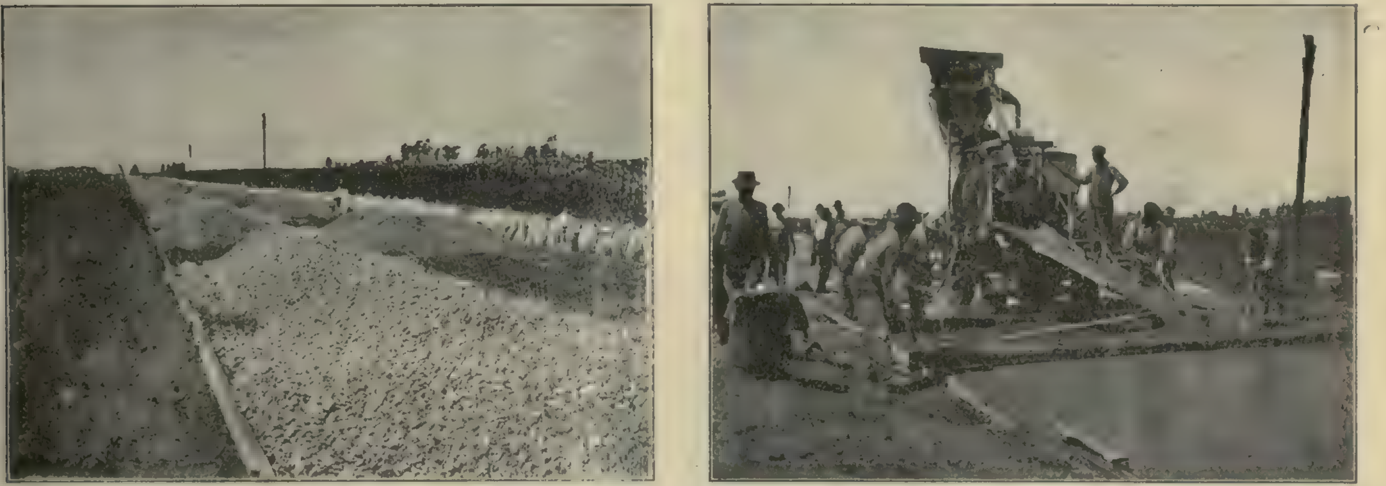
Concrete Road Building in Orange County, California

By J. MAUGHS BROWN*

In order to provide a county system of improved highways, the voters of Orange County, California, approved the issuance of bonds, to the amount of $1,275,000. The work planned under the bond issue comprised the construction of 130 mi. of roads and the work done is worthy of note, if for no other reason because of the fact that the funds were sufficient for the work proposed and a surplus of $200,000 was returned to the county treasury.

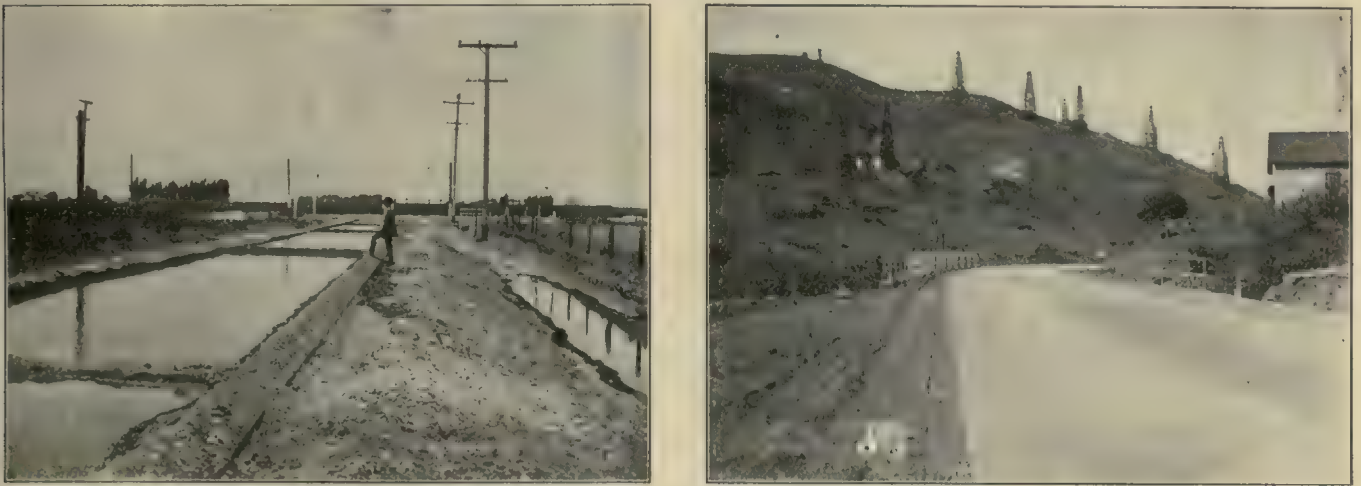
Orange County is situated on the Pacific Coast between Los Angeles and San Diego Counties and has an area of about 850 sq. mi. A considerable portion of the county is hilly, but the northwestern section is practically flat and in it the land is very well developed. The assessed valuation of the county in 1914 was about $50,000,000. In the developed section, the land varies in value from about $1,000 to $1,500 per acre, while the land in the rest of the county, except where oil has been found, averages much less in value.

The work of building the county highway system was carried out under the direction of the County Highway Commission, with Chief Engineer C. H. Finley in direct charge. The state highway, which runs through the county in a general northwesterly and southeasterly direction, was of concrete,



Distribution of Materials Along Road.

Depositing and Striking Off the Concrete.



Curing Pavement by Ponding Method.

Concrete Swept Clean, Ready for Mat.

STEPS IN THE CONSTRUCTION OF CONCRETE ROADS IN ORANGE COUNTY, CALIFORNIA.

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*Professor of Civil Engineering, University of South Dakota.

and it was decided to build the county roads of the same material. The standard construction adopted was a concrete pavement of 4½ and 5½ in. thickness covered with a ¼-in. mat surface of asphaltic oil and stone screenings.

The grading and the laying of the concrete were done by contract, while the asphaltic surfacing was put on by the county forces with county equipment. Concrete bridges, of which the slab and girder types predominate, were also built by contract.

In southern California, the engineer's selection of the type of drainage construction, while apparently simple, is in reality a somewhat complicated problem. Past experience indicates that severe storms are likely to occur at long intervals and the provision of sufficiently large waterways to take care of these infrequent but violent storms would necessitate an expenditure that in many instances would be all out of proportion to the benefits derived. These conditions have led to the building of what is known as the "ford type" of structure. These are so built that in case of a sudden flood the water can pass over the top of the structure without damaging it and at the same time traffic is able to pass, though it may have to travel through running water. In some cases, all of the flood water goes over the top of the structure which is merely a solidly built pavement crossing the flood channel. In other cases provision is made to pass the usual flow under the structure while most of the abnormal flow goes over the top.

As the roads improved under the bond issue were very largely those connecting important centers and districts, most of them had already been located. Since the county was originally laid out by the rectangular system of land subdivision, the problem in the well developed portion of the county consisted largely of relocating roads laid out along the section lines. In the rougher part of the county more latitude was possible in relocation, as the roads were not originally laid out along the section lines. The first roads built were 15, 16, and 18 ft. in width, according to the estimated amount of traffic. It was soon found that the improved roads drew to themselves greater traffic than had been anticipated, and the 15-ft. width was abandoned in the later work.

In southern California, during a large part of the year, the earth excavated is so dry that it cannot be properly consolidated without the use of water. Fills are therefore frequently flooded or irrigated to make the subgrade solid. In some cases a special form of sheep-foot roller was used to advantage in connection with watering. The specifications required that a thin layer of sand be spread over the finished subgrade where the soil was in the nature of adobe.

The pavements were built of 1:2½:5 concrete without expansion joints or reinforcement. The concrete was finished with a surface as smooth as could be obtained by floating, a smooth surface having been found to provide a better bond with the asphaltic mat surface—after the top film of laitance had been worn off by traffic—than the rougher finish. The pavement was cured by the ponding method, as shown in one of the accompanying illustrations. The water was kept on the

(*Concluded on page 60*)

Applying Oil With Pressure Distributor.

Oiled Strip, at Left, Ready for Covering.

Covering Oiled Strip With Screenings.

Screenings Being Worked in Under Traffic.

STEPS IN THE APPLICATION OF THE BITUMINOUS MAT—ORANGE COUNTY CONCRETE ROADS.

New Road Laws of Florida

As noted briefly in "Good Roads" for June 9, several laws governing the work of the State Road Department and the use of convict labor were passed by the 1917 session of the Florida Legislature. Among these were amendments to the law of 1915 establishing the State Road Department; a law accepting federal aid; a law creating a state convict road force; a law relating to the care of convicts and a law providing for the registering and licensing of motor vehicles.

The law amending the State Road Department Act of 1915 provides for the appointment of a state road department consisting of five members, as now constituted, and for the appointment of a state road commissioner and such assistants and clerical help as may be required. The act also defines the terms "road" and "roads" as including "all highways and ways for public travel, including means of crossing streams by ways of bridges and ferries, under the jurisdiction or control of the several boards of county commissioners in the several counties of this state, or upon which they may expend any public money or cause any work to be done, or any roads that may by this or any other act be placed under the supervision and control of the State Road Department."

The general power and duties of the department with respect to road building are set forth as follows:

> It shall be the duty of the department to collect data and information as to all roads in the state, and where practicable have maps and plats thereof made; to investigate and collect data and information as to the best methods and materials for road building and repair; to investigate and gather information as to suitable material for road building and repairing in the different localities in this state; to compile all such data and information; to furnish the same free to the county commissioners of the several counties of this state and to the citizens of this state; and to authorize and empower the State Road Department to enter into contracts for, and to make such rules and regulations as may be necessary for the construction and maintenance of such highways and bridges as may by law or by resolution of any board of county commissioners be placed under its supervision and control, together with all powers for the exercise of the right of eminent domain; and it shall be the duty of the State Road Department to prepare plans and specifications for all such proposed work, other than maintenance work of a regular or routine nature, and to advertise for bids on same at least once a week for not less than two consecutive weeks in some newspaper having general circulation in the county where the proposed work is located; and the State Road Department may, at its discretion, award the proposed work to the lowest responsible bidder, or it may reject all bids and proceed to perform the work with convict labor or free labor, and may purchase such equipment and supplies as may be necessary for the efficient and economical prosecution of the work.

The department is also directed to cause the state road commissioner or an assistant to visit the several counties as often as practicable and inspect the roads, the methods of construction and repair, and the materials used for such work, and report thereon to the department. It is also provided in this section that if the department shall learn that construction or repair work is being improperly or extravagantly done, or that improper or inferior materials are being used in any county, "so as to cause loss or waste of public funds," the department shall notify the county commissioners of the conditions, and if, after such notice is given, the county commissioners continue the use of improper methods or materials, the department shall report the matter to the governor of the state.

The law also directs the State Roard Department to send the state road commissioner or an assistant to the assistance of the counties whenever such action is requested by the county authorities. In such cases, this assistance is rendered without expense to the county, except that it must pay the actual traveling expenses of the commissioner or assistant. This same section also authorizes the State Road Department to "locate and designate certain roads in the state as state roads and to construct and maintain the same with funds which are now or may hereafter become available from the state or the state and Federal Government." The department is also authorized to "locate and designate certain other roads in this state as state aid roads and to construct and maintain the same with funds raised from federal, state or county sources." All state and state aid roads so designated are to be built and maintained under the supervision and control of the State Road Department.

In this same section of the law, the term "state aid," as used in the act is defined as "assistance rendered the respective counties by the state in the construction and maintenance of roads designated by the State Road Department as 'state aid roads'; contingent upon the county or counties so aided or assisted furnishing not less than one-half the total cost of the proposed work on such 'state aid roads' and also bearing not less than one-half of the cost of maintenance thereof."

Another section of the law provides that 15% of the amount of all licenses collected upon motor driven vehicles shall constitute a special fund for the maintenance of the State Road Department.

This law became operative on May 19.

The law accepting federal aid contains the usual clause accepting the provisions and requirements of the federal aid law and authorizes and empowers the State Road Department to act for the state. This law makes the following appropriations to meet federal aid: $56,000 available for the year beginning July 1, 1916; $112,000 available for th year beginning July 1, 1917; and $168,000 available for the year beginning July 1, 1918. A special levy of not over ½ mill on each dollar of the assessed valuation of all taxable property in the state is authorized to meet these appropriations.

The law providing for the state convict road force creates such a force to include not more than 300 state prisoners capable, in the opinion of the State Prison Physician, of doing road work. This force is to be "directly under the supervision and control of the State Road Department subject to the supervision of the Board of Commissioners of State Institutions." The details of the method of applying the labor of the road force on state or state aid roads are set forth in sections 6, 7, 8 and 9 of the law, which are as follows:

> Sec. 6. The State Road Department may, in its discretion, apply the labor of the state convict road force herein provided for to the construction and maintenance of either state or state aid roads, giving the several counties of the state as nearly equal service as practicable; provided: that no part of the state convict road force shall be worked upon any state aid road unless the county in which such proposed state aid road is located shall provide not less than one-half of the total cost of the proposed work, inclusive of the cost of maintaining the convicts employed on such work, and also agree to bear not less than one-half of the cost of future maintenance. Should any county fail at any time to meet the requirements of the State Road Department on the terms agreed upon, in the proper construction and maintenance of a state aid road, it shall be the duty of the State Road Department to withhold from such county all further state aid of any description until such terms of agreement have been complied with.
>
> Sec. 7. It shall be the duty of the State Road Department to advertise for bids on all roads and bridges to be constructed with convict labor, such advertisement to appear at least once a week for not less than two consecutive weeks in some newspaper having general circulation in the county where the work is to be performed, and such advertisement shall briefly de-

> scribe the work and set forth the terms under which the convict labor shall be employed. The State Road Department may award the work to the lowest responsible bidder, or it may, in its discretion, reject all bids and proceed to purchase such equipment and supplies as may be necessary to carry on the proposed work in an efficient and economical manner. Nothing in this section shall be construed as pertaining to maintenance work on roads and bridges, and it shall be discretional with the State Road Department as to whether work coming under the head of maintenance shall be advertised for bids.
>
> Sec. 8. Should a contract be awarded for road work to be done with convict labor, the terms of the contract shall provide that the convict labor shall be furnished to the contractor at a specified rate per hour, this to be determined by the State Road Department, which rate shall cover the cost of housing, guarding and maintaining the convict labor, which shall be worked at all times under the rules prescribed by the State Road Department, said department being charged with the guarding, discipline and general care of the prisoners while engaged on such contract work.
>
> Sec. 9. All prisoners employed on the state convict road force shall be transported, housed, fed, clothed and guarded, from such funds as are or may hereafter be appropriated for the use of the State Road Department.

This law became effective on May 30.

The automobile license law describes in detail the methods of registering and licensing motor vehicles, including "motorcycles, automobiles, motor trucks, and all other vehicles operated over the public streets and highways of this state and propelled by power other than muscular power, except traction engines, road rollers, and such vehicles as run only upon tracks."

The fees provided by the law are as follows: Motorcycles, $2; automobiles and other motor-driven vehicles with a seating capacity of one and not more than five persons, $5; automobiles of more than 25 hp. and not more than 40 hp., $12; automobiles of more than 40 hp. and not more than 60 hp., $15; automobiles of over 60 hp., $30; any type of automobile seating 10 or more passengers, $100; motor trucks of not more than 1 ton, $10; motor trucks of more than 1 ton and not more than 2 tons, $25; motor trucks of more than 2 tons and not more than 4 tons, $35; motor trucks of more than 4 tons, $100. The fees for motor trucks are for trucks hauling any load other than passengers. Motor trucks operated by county commissioners on county roads in construction and repair work are not subject to these fees. The provision relative to trailers is as follows:

> No license fee shall be required for a single trailer of not more than 500 lb. capacity. When more than one trailer of not more than 500 lb. capacity is attached to a single motor vehicle or when one or more trailers of more than 500 lb. capacity are so operated, the same license fee shall be paid on each and every trailer so operated as is herein required for a motor vehicle of the same capacity.

Dealers' registration fees are placed at $15, this covering five number plates. Additional number plates must be secured by additional registrations.

The law also contains provisions for adequate safety appliances, brakes, signals, lights and speed. The provision regulating speed provides that "no person shall operate a motor vehicle on the public highways of this state recklessly or at a rate of speed greater than is reasonable and proper, having regard to the width, traffic and use of the highway, or so as to endanger the property or the life or limb of any person." It is provided, however, that if the rate of speed exceeds 25 mi. an hour for a distance of ½ mi., such rate "shall be prima facie evidence that the person operating such motor vehicle is operating the same at a rate of speed greater than is reasonable and proper, and in violation of the provisions of this act." It is also provided that a speed greater than 10 mi. shall be prima facie evidence of violation of the act, "where the operator's view of the road and traffic is obstructed, when approaching a crossing or intersecting public highway, or when traversing a bridge, or a sharp turn, or a steep descent, or a curve in the highway."

The disposition of the funds secured from the motor vehicle act is to be as provided in the following paragraph:

> All moneys paid into the state treasury under the provisions of this act, except such as shall be first set aside to pay for number plates, postage on same and the actual clerical work required under the provisions of this act, shall be apportioned as follows: 15% shall be set aside for the maintenance of the State Road Department as provided for in Section 10, Chapter 6883, Laws of Florida, and 85% shall constitute a state maintenance fund for the maintenance of state and state aid roads and bridges, and shall be apportioned to the several counties in proportion to the total state tax paid by each county into the state treasury, and shall be expended by the State Road Department in the maintenance of the above named classes of roads and bridges. Where no state or state aid roads and bridges exist in any county at the time such apportionment is made, or where the entire apportionment to any county is not required for the maintenance of the above named classes of roads and bridges, then the whole or a part of such apportionment may be used for the construction of state and state aid roads and bridges until a maintenance charge has been created sufficient to require the entire apportionment.

This act was approved on May 28, and will become operative Jan. 1, 1918.

A law providing for the protection of roads approved on May 22 and effective on that date, is in part as follows:

> Sec. 1. It shall be unlawful for any individual, firm or corporation to drive, propel or operate, or to have driven, propelled or operated, over the hard-surfaced public roads of this state any vehicle or implement having wheels provided with sharpened or roughened surfaces, or provided with other than smooth tires, that will carry more than 200 lb. per wheel for every vehicle having tires of 1 in. in width, or 500 lb. per wheel for every vehicle having tires of 2 in. in width, or 800 lb. per wheel for every vehicle having tires of 3 in. in width, or 1,200 lb. per wheel for every vehicle having tires of 4 in. in width, or 1,500 lb. per wheel for every vehicle having tires 5 in. in width, or that will carry any load greater than 6,000 lb. without first providing 1 in. of tire width per wheel for each additional 2,000 lb. or fraction thereof, or to permit any vehicle or implement or any load or portion of load thereof to drag upon the surface of any hard-surfaced public road; provided: that nothing in this act shall be construed as prohibiting the use of roughened surfaces on rubber tires or on the wheels of farm implements weighing less than 1,000 lb.
>
> Sec. 2. Any individual, firm or corporation, or any agent of such individual, firm or corporation, violating the provision of Section 1 of this act, shall, on conviction thereof, be punished by fine of not exceeding $100, or by imprisonment in the county jail not exceeding six months, or by both such fine and imprisonment, in the discretion of the court.
>
> Sec. 3. Hard-surfaced public roads, as defined by this act, shall be construed to be brick, concrete, asphaltic or bituminous surfaced roads which are maintained by county or state funds.

A law relative to road and bridge districts provides that any special road and bridge district may be abolished by a majority vote at an election called by the board of county commissioners of the county, provided that no special road or bridge district may be abolished while it has outstanding indebtedness unless provision for liquidating such indebtedness is made.

Missouri State Road Contracts

The Missouri State Highway Department has just submitted to the Secretary of Agriculture project statements for the improvement of 25 mi. of macadam and gravel roads in Cole County, and 8 mi. of concrete roadway in Jasper County. The Cole County project will cost $115,000, while the Jasper County project will cost $97,000.

The State Highway Department, operating under the new law, will supervise the building of more than $14,000,000 worth of roads during the next four years.

The State Highway Department of Pennsylvania recently asked for estimates on 500 licensed operators' badges and 75,000 licensed drivers' badges for the year 1918. The badges are to be oval in form, 2½ x 1¾ in. in size, with lettering and numbers stamped in black enamel. Estimates were asked for heavy nickel plated German silver and also for heavy nickel plated brass.

Street Expenditures and Street Plans*

By W. A. McLEAN†

Villages, towns and cities grow up at the place where roads meet; at the crossroads, or where highway meets railway, and where railway meets railway or water route; at the focal point of transportation and traffic. The road intersection is the nucleus from which village and city are developed. Roads and streets constitute the primary framework of town growth, and too much importance can scarcely be attached to the road and street in all civic planning and organization.

The supervision of street improvement and maintenance is a function common to all village, town and city councils. Municipal works and services are many and varied, including water supply, sewers and sewage disposal, health protection and sanitation, parks, fire protection, street cleaning and sprinkling, garbage collection, street railway management, public baths and playgrounds, municipal franchises, bridges, survey and town planning, assessment and municipal finance.

The complexity of municipal services is nearly as great for a town as for a city. The city requires large works, but there is proportionately a great amount to spend upon them. Towns require waterworks, sewers, sewage disposal plants and well designed streets, but they have to be obtained for a less expenditure—and the greater economy very often demands proportionately greater skill. The planning of a town in all these respects should, as far as practicable, be undertaken as one work, not as a series of disconnected sections. Just as a house is now planned with water service, waste pipes, sewer connections, and electric wiring, considered in connection with foundations, walls and partitions, so the more nearly a town's services can be dovetailed into the one system, will there be less future expense when these are installed. The tearing up of pavements to lay sewers, water and gas mains is one of the common results of unsystematic methods.

While many municipalities may not be concerned with waterworks, water purification, sewage disposal, electric lighting, power and gas supply, there is no village so small, but is concerned in some degree with its public street or streets.

The improvement of streets in a village, town or city should not be taken up as a series of independent patches, but should conform to a broad, general plan of improvement, in which each unit will have its place, and which will ultimately produce a complete scheme of development for the entire municipality. It is not suggested that street paving in any municipality should be taken up and completed throughout as a continuous work in one or two years. Street improvement in a town or city can rarely be carried out as one work; but is a matter of growth extending over a period of years—a single street, or even one block at a time. But whatever the rate of construction, it should be in conformity with a broad plan of improvement to be followed as far as practicable by succeeding councils.

The aggregate amount spent on streets is very large. The drain is yearly and continuous. Ratepayers as a rule do not realize how important is this phase of municipal management, from a financial standpoint. In spite of considerable expenditures, numerous municipalities have little to show for the outlay. Fearing criticism, many councils hesitate to obtain the advice of an engineer experienced in this branch of municipal service. Money is spent year after year in half-way measures, in "old ruts" with little or no permanent return. That municipality is fortunate which has today secured thoroughly improved streets without having first made a large expenditure or accumulated a considerable debt with little or nothing of permanent value to show for it. The large debts with which cities and towns in Ontario are sometimes burdened, are due not so much to the assets actually provided, as to the ill-advised and half-way measures so often followed, which result only in temporary or partial service, and which are in the end torn up and "scrapped" to give place to the work which should have been done in the beginning.

Street improvement is the object of considerable expenditure in many towns and villages. In some cases substantial work has been obtained for the outlay. In others, comparative failure has resulted. Some have made an ambitious attempt to construct well designed streets, with curbs and with metal or pavement from curb to curb. Others have adopted a less expensive design, seeking only a type of road that will prevent impassable conditions of mud in autumn and spring. Others seem to feel that when roadways have been built, no further expenditure for repairs is needed, while some approach the matter from the opposite viewpoint and hope to obtain satisfactory streets by merely dumping stone or gravel in spots where the mud becomes deepest, a more or less habitual scheme of patching.

Estimates of cost are subject to a number of qualifications. One street may, in appearance, when completed, be exactly similar to another, and yet the cost of the work in one case has been twice that in another. Differences in amount of grading and earth work may be a reason. A deep ravine, the haulage of earth to widen the roadways, or the moving of earth to straighten the street, may account for a considerable sum. The excavation of clay and bowlders is more costly than the removal of sand. Length of haul for stone or other materials composing the road will make a marked difference. . Wet weather disorganizes the work and adds to the cost, while the rate of wages varies from season to season.

But the most important factor, one which is most commonly ignored, is the efficiency of supervision. The duty of the engineer is to design the work, give lines and levels, prepare plans and specifications and provide inspection to see that the construction is in accordance with them. Good service in this respect is essential, but is not always a material factor in the cost. The point at which money is most often lost when the work is carried on by day labor, is in neglect to provide a thoroughly competent construction manager, a man experienced in and conversant with the organization of labor to produce the desired results expeditiously and with the least "lost motion." Under an inferior superintendent men may fritter away their time, teams may work at half their capacity, machinery may be out of order and idle—all tending at times to unnecessarily increase the cost of the work. The management of the work is rarely the duty of the engineer. If a municipal council has not the necessary construction manager at its disposal, the work should be let by tender, throwing the onus of good management upon the contractor who will work under the supervision of the engineer and an inspector appointed by the engineer.

The manner in which streets are laid out is a determining factor in many details of a city's welfare. Natural advantages of a situation, by poor street location, may be lost or even converted into obstacles; while on the other hand, apparent obstacles to development, if wisely considered, may be converted into advantages by a suitably arranged street system.

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*From "Report on Street Improvement, Ontario, 1917," an appendix to the annual report of the Department of Public Highways of Ontario.

†Deputy Minister of Highways, Ontario.

The favorable situation of a business thoroughfare, the accessibility to the residential section, the opportunity for factory and industrial sites, the convenience of railway and shipping facilities, easy drainage, are intimately bound up with the arrangement of streets which may tend to the congestion of traffic or may tend to traffic diffusion. A large economy (or waste) of time and money may, for all future, be dependent upon the initial plan of streets.

Motor traffic is making an unprecedented demand upon the carrying capacity of city streets. The number of motor cars in the province is growing rapidly. In 1904 there were registered 535 cars; in 1914, 31,724 cars; in 1915, 42,346 cars; in 1916, 54,375 cars. In 1917, it seems probable that the number may exceed 65,000, and 100,000 cars is a possibility in the not far distant future. This traffic will, proportionately, converge on city streets; and to meet its needs main diagonal thoroughfares will be found a most effective solution. The majority of urban municipalities in Ontario have been subdivided on a rectangular system. Main diagonal thoroughfares shorten distance, save time, and prevent traffic congestion.

The aggregate economy and the diffusion of traffic produced by diagonal thoroughfares render them an important key to the traffic situation of the future. The more important cross or connecting streets may then be laid out as a series of rings, the entire system resembling a spider-web rather than the common "gridiron" plan of streets.

There are few cities of importance which today, if it were possible, would not make radical changes in the layout of their streets. Many cities, after laboring under a handicap for years, have been compelled to carry out expensive schemes of street widening and of opening new thoroughfares to overcome the defects created by neglected growth. The lesson is obvious. Forethought and intelligent planning applied to the street system during the period of growth are fundamental to favorable urban development.

Every town and city desires to grow. Growth is the natural and healthful tendency of a prosperous community. The country road of today is the city thoroughfare of tomorrow. The present sparsely occupied suburban area may quickly become the residential annex, or the industrial district, under development of the not far distant future. A city has an immediate interest in the territory over which growth may be anticipated, and in the location of main thoroughfares through that territory.

The value of radial roads, the "spider-web" system, applies both to rural and urban conditions. Excellent examples of the former are to be found in war maps of France and Flanders, where main highways radiate naturally from all industrial centers.

The Type of Road

By RODMAN WILEY*

When we speak of a road, the average man usually pictures in his mind a macadam road, perhaps because that was one of the earliest types of hard-surfaced roads. In early times because of the almost impassable condition of the tributary roads, which necessarily limited the haul, very light loads usually passed over the main thoroughfares. But in recent years, when practically all roads have been more or less improved, it has been possible to load wagons to their full capacities, and very little consideration has ever been given to the fact that the tires were entirely too narrow for the excessive loads. Owing to the condition of the secondary roads, particularly before the advent of the automobile, macadam roads served to accommodate the horse-drawn traffic.

In recent years the kinds and volumes of traffic have changed, and yet the roads have not been designed to meet such changes in traffic conditions, and it is not an extravagant statement to say that hundreds of millions of dollars have been foolishly expended in building the wrong type of road.

It is just as unbusinesslike to build the same type of road in all localities as it is for a farmer to build the same type of fence to care for chickens, mules and hogs, or for a lawyer to use the same line of argument in the defense of every case, or for a dentist to use the same type of instrument for all dental work, or a surgeon to have only one instrument with which to perform all operations.

Railroad companies early appreciated the fact that the type of surfacing employed was a most serious problem if the road were to be economically run, and today, where the traffic demands, we see single, double, triple and quadruple lines of track; in some instances 90 lb. rails, in others 80, 70, etc., depending only on the loads to be carried and the maintenance costs involved.

The board of directors of a railroad company, however, intrusts such problems to its chief engineer. He alone recommends the number of lines of track, the weight of rail to be used, etc. Yet when it comes to highways the members of some board of commissioners or other governing body in the hands of which has been placed the handling of the county road funds, will decide among themselves what type of road should be built, in most instances being governed in their decision by the type that can be built for the least expenditure, their idea being to scatter the road fund throughout the county to serve what they are pleased to call their "constituents." Rarely, if ever, do they stop to think that in most instances the road costing the least amount of money is the most expensive type to build, considering first cost, interest and maintenance.

Main thoroughfares built of macadam might have to be resurfaced every two or three years, which would mean the road would cost from $1,000 to $2,000 per mi. per year, and it should be apparent to any right thinking man that there is not a county in existence that could afford to expend that amount of money per mile each year to maintain its road system.

The type of road should be governed by the traffic which may reasonably be expected to pass over the road during its life. Climatic conditions and the availability of materials will also govern the type to some extent, the idea being that a type of road should be built which will represent an economical investment. A possible way of estimating the traffic is to take a census of what is passing over the road at present, giving due consideration to the fact that in a short time practically every farmer living along the line will buy an automobile and that a certain per cent. of the people living in all villages through which the road passes will sooner or later own cars, to make some provision for through tourist travel, and then to design the road accordingly. All of the above requires the services of an experienced highway engineer, and it is not supposed that any other class of men is able to handle the job.

Railroad companies pay reasonable dividends on their investments because the construction and maintenance of their lines are in the hands of competent engineers, and yet the management of road affairs is rarely, if ever, intrusted to a competent engineer. The people seem to forget that in practically every county in Kentucky and a great many other states 50% of all county taxes collected is used for

(*Continued on page* 60.)

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*State Commissioner of Public Roads of Kentucky.

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

AUGUST 4, 1917

LIGHTS ON VEHICLES

Safety to users of the highways depends very largely upon the users themselves, for almost any passable road can be traveled without mishap by the exercise of care. At the same time those who walk or ride upon the public roads are entitled to all the protection that can be given them at a reasonable cost—in other words, it is a part of the public's duty to assure the individual's safety in the ordinary use of the roads.

This safeguarding of traffic is chiefly accomplished by the proper construction, maintenance and repair of the roads and by the regulation of traffic through laws that are enforced. Neither alone is sufficient, nor are both together adequate without the cooperation of the road users.

Travel at night involves most of the ordinary day-time dangers of the road and others peculiar to the dark, and in order to minimize these so far as possible most states have enacted elaborate and strict laws relative to lights on motor-driven vehicles. As a rule, these laws prescribe the number and position of lights, provide for the employment of dimming devices, specify the hours during which lights must be used, regulate the character and intensity of the illumination and include various other provisions presumably calculated to make night driving safe for the occupants of motor vehicles and for others on the roads. Some state laws also provide that horse-drawn vehicles must carry lights, but sometimes exempting vehicles of certain kinds.

The laws relating to motor-driven vehicles are enforced—in most places rather rigidly. But laws for lights on horse-drawn vehicles are more often not enforced.

There is much need for uniformity in the laws governing the lighting of vehicles, and automobile organizations could do much good in working for better legislation along this line. A horse-drawn vehicle needs a light quite as much as a motor vehicle does, and there is no justice in compelling pleasure cars and trucks to observe a lighting law that does not apply to pleasure and business vehicles drawn by horses.

Automobile clubs and similar organizations could also render service to all drivers of motor vehicles by securing the enforcement of such laws as there are compelling the use of lights on horse-drawn vehicles. Accidents are especially likely to occur where such laws are on the statute books but are not heeded, for the driver of an automobile is less on the alert than when he knows that the horse-drawn vehicles he meets or passes will not be lighted.

A THANKLESS TASK FOR HIGHWAY ENGINEERS

No one phase of the great task of providing this country with good roads is more strictly an engineering problem than the selection of the type of pavement or surfacing for a given highway. And, with the possible exception of the planning of road systems, no part of the work is more frequently taken out of the hands of the engineer.

A community stricken with bodily ills, an epidemic for instance, would undoubtedly call in physicians; one in legal difficulties would unquestionably put its affairs in the hands of lawyers. By every canon of logic and common sense, a community suffering from the effects of bad roads should call in a highway engineer or a board of highway engineers. Occasionally such a thing does happen—and the circumstances are set forth at length in the public prints. The more general practice, however, is to muddle along under one set of politicians after another or else put the matter into the hands of a "committee," the personnel of which as a general thing includes anything and everything but engineers.

All this is set forth in different language elsewhere in this issue in an article by Rodman Wiley, State Commissioner of Public Roads of Kentucky, but the salient facts bear repetition. Commissioner Wiley concludes his article by saying: "When the people realize that the building of roads, and especially the selection of the type of road, is a high class engineering problem and that such matters should be intrusted to high class highway engineers, amply paid, the same as men in other professions, then and only then will the taxpayers be properly safeguarded and will we experience a wise and economical expenditure of road funds."

There is no doubt of the truth of that statement, but before the people do realize the necessity of leaving engineering to engineers a great deal of educational work must be done. And this work will have to be done by the engineers themselves, either directly or indirectly. In the nature of the thing, it will be a thankless task—and worse—for the average layman will see no motive other than a selfish one. At the same time it is a work well worth the doing, even though the knowledge of a duty done is the only reward to be expected.

A Loss of $300,000 to the People of Douglas County, Nebraska, is said to result from the lack of maintenance of its macadamized roads. The county has 38.6 mi. of this type of highway, built at an average cost of $10,000 per mi. It is stated that the paved roadway is so worn in portions of it that it has been abandoned by automobiles and farm wagons for the dirt road at the side.

The New Jersey State Highway Commission will hold hearings at Morristown, Hackettstown and Sussex on Aug. 23 and 24, concerning highway routes 5, 8 and 12. Route 5, as proposed, extends from Newark to Delaware via Morristown, Dover, Budd Lake and Hackettstown; Route 8 from Montclair by way of Franklin and Sussex to the state line near Unionville; and Route 12, from Paterson to Phillipsburg.

Contracts for Road Construction in Mahoning County, Ohio, were let recently for the following roads and amounts, the cost to be paid by money from the county and township bond issue of $158,000: New Buffalo-Riblets Corners Road, $14,658.97; Orrs Corners-Silica Quarry Road, $4,456.05; McClurg Road, $10,997.63; Burkey Road, $16,771.94; Salem-Warren Road (in Ellsworth Township), $28,733; Damascus, Berlin and Pricetown Road (in Milton Township), $20,565.35.

The Type of Road

(Continued from page 58)

road purposes and has been used for road purposes for years. With the other 50% they built court houses, hospitals, poorhouses, support the paupers and pay the salaries of the officers who administer the law. In other words, they have something to show for the expenditure; but for the 50% invested in roads it would be difficult for almost any county to show that the money has been properly expended.

The day will come, and it should not be far distant, when the taxpayers will appreciate the fact that the roads are their property, that the same care should be given to the expenditure of such funds as is given to the management of their own private affairs. When they are ill, they consult a doctor; any legal problems are intrusted to a lawyer, and for the salvation of their souls they usually accept the advice and recommendations of ministers of the gospel. When they employ labor, it is their aim to secure a man who is familiar with the work he is supposed to perform, and yet when it comes to road affairs they eagerly listen to any demagogue who has pet theories concerning road building, forgetting that there are accepted standards for road work the same as for building railroads, steam engines, or office buildings. The demagogue's sole aim is to get into office by making misrepresentations to the people whose money he will squander.

When the people realize that the building of roads, and especially the selection of the type of road, is a high class engineering problem and that such matters should be intrusted to high class highway engineers, amply paid, the same as men in other professions, then and only then will the taxpayers be properly safeguarded and will we experience a wise and economical expenditure of road funds.

Concrete Road Building in Orange County, California

(Continued from page 54)

pavement for a period of 12 days. The materials for the mixer were hauled to the work and dumped on the subgrade ahead of the paving operations, so that very little extra handling was required. Because of the dry atmosphere and the practical certainty of clear weather during the construction season, it was possible to pile all of the materials, including cement, ahead of the work on the subgrade.

The surface mat was composed of screenings, designated as No. 4 stone, and a heavy asphaltic oil. The stone varied from ½-in to dust and, with the binder, formed a surface from ¼ to ⅜ in. in thickness. The oil was a 90% asphalt oil obtained from the northern part of the state. In the early work the mat surface was placed on the concrete soon after the pavement had hardened, but this was found unsatisfactory as the surface peeled off in spots. It was at first supposed that this was due to the lack of adhesion between the mat and the concrete surface, but this was proved to be incorrect, as an investigation showed that a thin film of concrete always came off with the mat. To remedy this, the road was subjected to traffic for three or four months before applying the mat surface. This permitted the worthless material at the top of the concrete, commonly called laitance, to wear off, and mats applied on the resulting surface gave no further trouble.

In applying the asphaltic surfacing, the concrete was first swept clean, after which the screenings were placed on the road and distributed in a long row along the roadway by means of a light road grader. A strip adjacent to the row of screenings was again swept clean and covered with ¼ gal. per sq. yd. of heavy asphaltic oil, at a temperature between 300° and 400° F., by means of a pressure distributor. The grader was then used to spread the screenings over the oiled strip, as shown in one of the accompany illustrations. The road was completed in successive strips and opened to traffic. After the oil had taken up all of the screenings it could, another application was made at the rate of ⅛ gal. per sq. yd., and the remainder of the screenings were placed on top of this and any excess oil was taken up by the addition of sand.

In some places, where the traffic was especially heavy, it was found necessary to modify this process because the roads broke through the coat first applied before the second application could be made. This difficulty was overcome by putting the oil on in one application of about ⅜ gal. per sq. yd., covering with screenings and leaving for the traffic to consolidate.

The roads were completed by improving the shoulders by the addition of gravel or decomposed granite and planting deodar trees along the roadside.

The cost of the concrete pavement averaged about 90 ct. per sq. yd. and the surface mat about 10 ct. per sq. yd.

The concrete has cracked at fairly regular intervals, usually transversely. Even without the surface mats, the cracks seemed to stand up well for a short time under traffic largely composed of motor vehicles. Where there was much heavy teaming on roads where the mat had not been placed, there was considerable spalling at the joints. Where this happened, repairs were made by filling the cracks with oil and screenings.

Survey reference points were preserved by the heads of large bolts protruding about ¼ in. from the concrete and therefore practically flush with the finished surface.

Sale of Oregon State Highway Bonds

The State Highway Commission of Oregon will sell state highway bonds to the amount of $500,000, or part thereof, at the Capitol Building, Salem, Ore., on Aug. 7. The bonds bear interest at 4% per annum and are dated Aug. 1, 1917. The principal of this issue of bonds is payable as follows: $12,500 on Oct. 1, 1922, and a like amount each April 1 and Oct. 1 thereafter until the full amount is paid, interest coupons payable April 1 and Oct. 1. The principal and interest are payable at the office of the State Treasurer at Salem, Ore., or at the office of the fiscal agent of the State of Oregon (National Park Bank) in New York City. Accrued interest from Aug. 1, 1917, to the date of delivery of bonds will be added to the amount of the successful bidder. The purchase price is to be paid on delivery of the bonds, within 14 days from Aug. 7. A certified check, payable to the Oregon State Highway Commission, for 5% of the amount of the bid, must accompany each bid, which check will be forfeited to the state if the purchase is not completed.

Another issue for road construction and for the use of the State Highway Department is being offered for sale concurrently with the issue above mentioned. This is for $400,000, and the bonds will be sold under the authority of the State Board of Control.

The assessed valuation of the State of Oregon for 1916 was $878,763,944.71, exclusive of the lands claimed by the Southern Pacific Company, formerly assessed at more than $20,000,000. This valuation represents about 60% of the wealth of the state. The state now has but $450,000 worth of bonds outstanding, these being known as the Rural Credit Farm Loan bonds.

The amount of bonds authorized to be issued by the State of Oregon is as follows: Two per cent. for rural credit loan purposes; $6,000,000 for road purposes, and an additional $1,900,000 to meet federal aid apportionments.

The $500,000 and the $400,000 issues represent the first installment of the state highway bonds.

Distribution of Township Bonus Fund in Pennsylvania

Certification to the Auditor General of Pennsylvania of the amounts of the township bonus fund, which are due the various townships of the state for the years 1910 and 1912, is being made by the State Highway Department.

The 1917 legislative appropriation to be used for the payment to the townships of the state's share of the cash tax bonus for the years 1910, 1911 and 1912 was $1,873,470.40. Of this sum $929,335.20 will be distributed to the townships of the state during 1917, as the law does not permit the distribution of the entire appropriation in any one year. The 1910 bonus amounts to $727,375.34 and the 1912 bonus is $201,959.86. This leaves $994,135.20 of the total appropriation, which represents the state's share to the townships for the year 1911 and which will be distributed to them during 1918.

Before they are eligible for this cash bonus, the townships must file their annual reports with the Bureau of Township Highways, of the State Highway Department, which reports, according to law, should be filed annually on or before Jan. 1.

As noted in the issue of July 7, First Deputy State Highway Commissioner Joseph W. Hunter, in charge of the Bureau of Township Highways, recently notified all delinquent townships that their reports must be filed with the bureau on or before Aug. 1, 1917, in order to receive their share of this fund.

An agreement must be filed by the township with the State Highway Department, to the effect that an amount equal to the sum received from the state will be expended by the township authorities for any of the following purposes:

Buying and installing concrete, cast iron, or corrugated pipe and installing concrete or stone masonry headwalls; the construction of concrete culverts and of concrete or steel bridges, according to plans approved by the Bureau of Township Highways; grading, widening, or straightening roads; the construction of brick, concrete, macadam, slag, gravel or flint roads; the construction of concrete or concrete and stone masonry retaining walls to support roads; the townships' share of the cost of state aid road construction.

The first act providing for the township bonus was passed by the 1905 legislature. By its provisions any township abolishing the work tax for roads by a vote of its electors would receive from the state a bonus of 15% on all cash road tax collections. This law was amended at the 1909 session, at which time all work taxes were abolished and all road taxes were required to be paid in cash. This legislature increased the bonus to 50% of the amount of cash road tax collected.

Appropriations, however, were not made promptly and the deficit was increasing so rapidly that the 1915 legislature suspended the bonus feature entirely until all deficits were paid in full.

After all payments of the township cash tax bonus, as provided for by the 1917 legislature, are made, there will remain unpaid $1,142,049.38, which represents the amount due the townships from the state for the years 1913 and 1914. This must be provided for by coming legislatures.

The total appropriations made under the operation of the various township bonus laws have been as follows:

1907	$150,000
1909	500,000
1909 (Deficiency Appropiation)	295,000
1911	500,000
1911 (Deficiency Appropriation)	690,000
1913	250,000
1913 (Deficiency Appropriation)	1,000,000
1915 (Deficiency Appropriation)	1,500,000
Total	$4,885,000

New Quarters of the Automobile Division of the Pennsylvania Highway Department

The removal of the offices of the Automobile Division of the State Highway Department of Pennsylvania from the Capitol Building in Harrisburg to the first floor of the Donaldson Building, 204 North 2nd St., has been announced. The work of registering motor vehicles and issuing license tags will be greatly facilitated under new arrangements planned by the Registrar, George M. Brusstar, as this division will have about three times the floor space it formerly occupied. The vacated offices will be at once occupied by other divisions of the department, which are now overcrowded.

Investigation of Road Materials in the Atlantic and Gulf States

As a part of the work of the National Research Council of the Council of National Defense, a Committee on Available Materials for Rapid Railroad, Highway and Fortification Construction Behind the Front was appointed to make investigations of road building materials in the Atlantic and Gulf Coast states. Dr. William Bullock Clark, State Geologist of Maryland, is in general charge of geological research work. H. G. Shirley, Chief Engineer of the Maryland State Roads Commission, has charge of the engineering work. They are being assisted by the state geologists and various state highway commissions, members of the committee, as follows;

Alabama: Prof. E. A. Smith, University; W. S. Keller, State Highway Engineer, Montgomery.

Connecticut: Prof. H. E. Gregory, New Haven; C. J. Bennett, State Highway Commissioner, Hartford.

Delaware: Dr. E. B. Mathews, Johns Hopkins University, Baltimore; James Wilson, Highway Commission, Wilmington.

Florida: Dr. E. H. Selards, Tallahassee; W. F. Cocke, State Highway Commissioner, Tallahassee.

Georgia: Prof. S. W. McCallie, Atlanta; T. P. Stanley, State Highway Engineer, Athens.

Louisiana: Prof. F. V. Emerson, Baton Rouge; W. E. Atkinson, State Engineer, New Orleans.

Maine: Dr. H. P. Little, Waterville; Prof. W. E. Ford, New Haven, Conn.; Paul D. Sargent, Chief Engineer, State Highway Commission, Augusta.

Massachusetts: Prof. B. K. Emerson, Amherst; Arthur W. Dean, Chief Engineer, State Highway Commission, Boston.

Mississppi: E. N. Lowe, Jackson; X. A. Kramer, State Highway Engineer, Jackson.

New Hampshire: Dr. J. W. Goldthwaite, Hanover; F. E. Everett, State Highway Commissioner, Concord.

New Jersey: Dr. H. B. Kummel, Trenton; R. A. Meeker, State Highway Engineer, Trenton.

New York: Dr. C. P. Berkey, New York; E. A. Duffey, State Highway Commissioner, Albany.

North Carolina: Dr. Joseph Hyde Pratt, Chapel Hill; W. S. Fallis, State Highway Engineer, Raleigh.

Pennsylvania: Dr. R. A. F. Penrose, Jr., Philadelphia; W. D. Uhler, Chief Engineer, State Highway Department, Harrisburg.

Rhode Island: Dr. Charles W. Brown, Providence; I. W. Patterson, Chief Engineer, State Board of Public Roads, Providence.

South Carolina: Prof. Stephen Taber, Columbia; Capt. J. Roy Pennell, State Highway Engineer, Columbia.

Virginia: Dr. Thomas L. Watson, Charlottesville; G. P. Coleman, State Highway Commissioner, Richmond.

Texas: Prof. J. Udden, Austin; Prof. R. L. Morrison, College Station.

MEETINGS

Calendar of Coming Meetings.

August 15-17.—League of Wisconsin Municipalities.—Annual convention, Racine, Wis. Secretary, Ford W. MacGregor, Madison, Wis.

August 22.—Union of New Brunswick Municipalities.—Annual convention, St. John, N. B. Secretary, James King Kelley, St. John, N. B.

August 27-29.—Union of Canadian Municipalities.—Annual convention, London, Ont. Secretary, W. D. Lighthall, K.C., Westmount, P. Q.

Aug. 29-31.—Ontario Municipal Association.—Annual convention, Toronto, Ont. Secretary, B. H. Spence, 705 Lumsden Building, Toronto, Ont.

Sept. 5-8.—League of American Municipalities.—Annual convention, Gary, Ind. Secretary, Robert E. Lee, City Hall, Baltimore, Md.

Sept. 11-13.—American Association of Park Superintendents.—Annual convention, St. Louis, Mo. Secretary, Roland W. Cotterill, 533 City Hall, Seattle, Wash

Sept 18-20.—League of Virginia Municipalities.—Annual convention, Lynchburg, Va. Secretary, L. C. Brinson, Portsmouth, Va.

Sept. 24-29.—League of California Municipalities.—Annual convention, Santa Rosa, Cal. Secretary, Wm. J. Locke, Pacific Building, San Francisco, Cal.

Oct. 17-18.—League of Minnesota Municipalities.—Fifth annual convention, St. Cloud, Minn. Secretary-Treasurer, Richard R. Price, University of Minnesota, Minneapolis.

Nov. 19-24.—City Managers' Association.—Annual meeting, Detroit, Mich. Secretary, W. L. Miller, City Manager, St. Augustine, Fla.

Nov. 21-24.—National Municipal League.—Twenty-third annual meeting, Hotel Statler, Detroit, Mich. Secretary, Clinton R. Woodruff, 703 North American Building, Philadelphia, Pa.

League of American Municipalities

The postponement of the annual convention of the League of American Municipalities, which has been announced for Sept. 5 to 8, has been requested by the president and secretary of the association.

County Commissioners of Pennsylvania

At the annual election of the County Commissioners of Pennsylvania, held recently at Pottsville, officers were named as follows: President, W. D. Reamer, Westmoreland; Vice President, John D. Jenkins, York; Second Vice President, W. C. Kraemer, Erie; Secretary, Addison White, Warren; Treasurer, William McElwee, Jr., Lawrence. Pittsburgh was selected as the place of the next convention.

National Old Trails Road Association

The annual convention of the National Old Trails Road Association will be held in Pueblo, Colo., Aug. 16 and 17. A large attendance is anticipated, and it is believed that the meeting will aid in securing the improvement of the road across the state.

According to the association, in the six years during which it has promoted an improved highway from Washington, D. C., to Los Angeles, Cal., more than $10,000,000 has been spent on the project and more than 1,200 mi. of the route completed. It has been signposted with steel enameled signs from Los Angeles to St. Louis, averaging one sign to the mile, and the work is progressing in other states.

Massachusetts Highway Association

The regular quarterly meeting and ladies' day of the Massachusetts Highway Association will take the form of a trip on Thursday, Aug. 9, to Portland, Me., where the members and ladies will be guests of the Portland Stoneware Co.

The boat for Portland will leave Boston, Mass., at 6:00 p. m., Wednesday, Aug. 8, and at 7.30 a. m. the party will assemble for breakfast at the Falmouth Hotel, at Portland. At about 9:00 a. m. Thursday electric cars will be provided for a tour of the city, the members and guests being offered an opportunity to view the pavements on the way. While members are inspecting the plant of their host, a special trip will be arranged for the ladies, after which the party will be taken on a special steamer for a pleasure trip through Casco Bay to South Harpswell. A shore dinner will be served at Long Island, the return to Portland to be made at 5:00 p. m.

J. M. McCarthy, State House, Boston, is Secretary of the Association.

Marginal Military Highway Conference

At a conference held in Mobile, Ala., called by the Chamber of Commerce of that city to discuss the question of a permanent military highway along the Atlantic, Gulf and Pacific Coasts and the frontiers of the United States, it was decided to form a permanent organization to cooperate with the federal government in the construction and maintenance of such a system. A number of states were represented at the conference. The War Department was represented officially by Major W. L. Guthrie. An organization committee was authorized consisting of Governor Henderson, of Alabama, Chairman, W. M. Clemons, Secretary, and W. D. Bellingrath, of Mobile, to select additional members to constitute a committee on publicity and permanent organization.

The conference indorsed the measure known as the Chamberlain Bill, which authorizes the Secretary of War to prepare plans for a comprehensive system of improved highways for military purposes.

Governor Henderson presided over the first day's meeting, and W. M. Clemons was made secretary. Communications from many prominent people indorsing the movement were read. Among these were Secretary of War Baker and Major General Leonard Wood.

The following resolutions reported by the Resolutions Committee, of which W. L. Weeden, of Boston, Mass., was chairman, were reported, and on motion of Capt. John Craft, of Alabama, were adopted unanimously:

> Whereas adequate national defense demands a mobile army and properly located and constructed highways over which an army with its equipment, supplies, munitions and modern artillery, may be quickly moved along our coast lines, and that there may be speedy and efficient concentration at any threatened point,
>
> Be it therefore resolved that the Marginal Military Highway Conference, assembled at Mobile, representing civic and commercial organizations from Atlantic, Gulf and Pacific Coast states urge upon the Congress of the United States the immediate passage of the measure known as the Chamberlain Bill, which provides that the Secretary of War shall cause to be prepared by the Chief of Engineers of the Department

of War a comprehensive plan of improved highways throughout the United States designed primarily with a view to facilitating the movement of military troops, equipment, munitions and supplies, in time of peace and in time of war, but at the same time, so far as reasonably compatible with said primary purposes, with a further view to accommodating the postal service, facilitating interstate and foreign commerce, aiding agricultural and manufacturing pursuits and promoting the general welfare of the people of the United States, and further provides for plans for a continuous main national highway to be constructed and maintained at the national expense along or near the Pacific, Gulf and Atlantic Coast, and the boundaries of the United States.

Be it further resolved, that this conference earnestly urges the Hon. S. H. Dent, Jr., Chairman of the Military Affairs Committee of the House of Representatives, to introduce in that branch of Congress the so-called Marginal Military Highway Bill and endeavor to obtain its immediate passage.

Be it further resolved, that Governor Charles Henderson and W. M. Clemens, Chairman and Secretary respectively of this conference, together with W. D. Bellingrath, with two additional members to be selected by them, shall constitute a committee on Publicity and Permanent Organization of this conference to all commercial highway and automobile organizations of the United States, and to urge that each of these organizations shall immediately lend their support and influence in securing favorable consideration of the Chamberlain Bill, and that when in their judgment, a permanent organization is feasible and desirable, that they shall proceed to perfect such organization.

PUBLICATIONS

DEPARTMENT OF PUBLIC WORKS, PHILADELPHIA, PA., PERMANENT COMMITTEE ON COMPREHENSIVE PLANS: Report on the Revision and Extension of the Street System in Southwest Philadelphia. Paper, 6x9 in., 25 pp. and covers; illustrated, inset maps.

This report, which was prepared by the Sub-Committee on City Plan of the Permanent Committee on Comprehensive Plans of the Philadelphia Department of Public Works, contains a detailed description of the conditions in southwest Philadelphia together with recommendations for improvements including the layout of streets, the establishment of playgrounds, land subdivision, and the extension of the park system. It is illustrated by half-tone views of present and proposed streets, by diagrams of streets and by inset maps showing present and proposed layouts.

PROBLEMS OF ST. LOUIS. CITY PLAN COMMISSION, ST. LOUIS, MO. Harland Bartholomew, Engineer. Paper, 6 x 9 in., 140 pp. and covers; illustrated; inset map.

The above named publication is a report on the present status of city planning in St. Louis, Mo., "being a description, from the city planning standpoint, of past and present tendencies of growth with general suggestions for impending issues and necessary future improvements." The introducory portion of the book deals with the growth of the city and its principal problems, and is followed by a thorough discussion of a major street plan for St. Louis. Such subjects as transit, transportation, districting, recreation, housing, location of public buildings, and the city's appearance are treated in separate sections. An appendix contains copies of proposed laws affecting the city plan. The illustrations consist of 15 plans and 24 half-tone illustrations, showing views of various streets and portions of the city.

PRACTICAL ROAD BUILDING, by Charles E. Foote. Cloth, 6 x 7½ in., 295 pp. and covers; illustrated. David McKay, Philadelphia, Pa., Publisher; $1.25.

This treatise on road building is intended, according to the author, to meet the demand for an engineering work giving concrete, practical information on the subject in a form that may be readily understood by laymen, and uses, as far as possible, therefore, non-technical language. The matter contained in the book is handled in two parts. Part I deals with general and primary questions under the following chapter headings: I.—A Sketch of Road History; II.—Road Location; III.—Road Grades; IV.—Road Drainage; V.—Road Foundations; VI.—Road Surfaces; VII.—Road Bridges and Culverts; VIII.—Road Traffic; IX.—Road Finance. Part II. takes up the question of different kinds of roads, a chapter being devoted to each of the following types: X.—Earth Roads; XI.—Gravel Roads; XII.—Sand-Clay Roads; XIII.—Top Soil Roads; XIV.—Macadam Roads; XV.—Brick Roads; XVI.—Concrete Roads; XVII.—Bituminous Roads; XVIII.—Sand-Asphalt Roads; XIX.—Special Surface Roads. The book includes "forewords" by George C. Diehl and Charles Henry Davis, respectively Chairman of the A. A. A. Good Roads Board and President of the National Highways Association, both of these organizations having given the work their indorsement. The book contains forty illustrations consisting of halftones and diagrams.

ILLINOIS STATE HIGHWAY DEPARTMENT: "Materials Available for Highway Construction in Illinois," Bulletin No. 14, prepared by F. L. Roman, Testing Engineer, Illinois State Highway Department. Paper, 6x9 in., 42 pp. and covers.

This bulletin contains a very comprehensive list of the sources of supply of road materials in Illinois and in the territory adjacent to Illinois in neighboring states. The materials listed are sand and gravel, crushed stone, paving bricks, Portland cement, and miscellaneous materials. Several pages are taken up by a list of sand and gravel producers furnishing materials for highway work in Illinois. In this list there are given the name of the pit, the name of the operator, the railroad or railroads over which shipments are made, and in most cases a very brief description of the facilities of the plant and a statement of the output. This is followed by a similar list of crushed stone producers, and of brick companies. There is also a brief section on cement manufacturing companies, which is followed by another brief section on miscellaneous materials. The text descriptions are followed by lists showing the location of sand and gravel deposits, rock quarries and paving brick plants. These are arranged in tabular form, the location and the railroad on which shipments are made being shown. The concluding table in the bulletin is a list of railroads arranged alphabetically showing the materials obtained along the lines and the locations of the deposits, quarries or plants. In the front of the book are two outline maps of the state on which the sand and gravel deposits and the stone quarries are noted by circles enclosing numbers referring to the descriptions elsewhere in the book.

PERSONAL NOTES

R. W. Tanner is Acting City Engineer of Paris, Texas, during the absence of Hans Helland, Jr., who has enlisted in the Engineers' Reserve Corps.

Donald A. Thomas, an engineer in the Michigan State Highway Department, and author of a number of articles appearing in "Good Roads," is now enlisted with the 16th Regiment of Engineers, U. S. A., which is one of the engineer regiments authorized to proceed to France for the purpose of rebuilding the railroads and highways in the devastated territory.

B. M. Williams, Assistant City Engineer, will succeed J. N. Gladding as City Engineer of El Paso, Texas.

O. Laurgaard has been appointed City Engineer of Portland, Ore., succeeding Philip H. Dater, resigned.

J. N. Gladding has resigned as City Engineer of El Paso, Texas, to become the partner of O. H. Thorman, architect.

A. M. Clopton, a well known road contractor of Elgin, Texas, died recently from the effect of injuries received in an automobile accident.

Hans Helland, Jr., City Engineer of Paris, Texas, has enlisted in the Engineers' Reserve Corps, and is in training at Fort Leavenworth, Kan.

Kirk McFarland, an engineer of the Illinois State Highway Department, has been appointed to a position with the State Highway Department of Missouri.

A. C. Hamilton, Jr., who for the past two years has been employed as assistant to R. S. Lander, Highway Engineer, Winchester, Tenn., has resigned to become an assistant with the Tennessee Highway Department. In this capacity he will have charge of state and federal aid work between Chattanooga and Nashville on the Dixie Highway.

Lewis T. Churchill is superintending the construction of concrete pavements and storm sewers in Lakewood, N. J., for the Joseph F. Burke Co., of Plainfield, N. J.

Chester D. Mann, of the United States Office of Public Roads and Rural Engineering, has joined the engineering force of the Missouri State Highway Department.

Wm. S. Moore, City Engineer of Grand Rapids, Mich., has been appointed State Highway Engineer of Indiana under the recent law creating a state highway commission.

Chester F. Lewis, formerly with the Massachusetts Highway Commission, has been appointed to an engineering position in the U. S. Office of Public Roads and Rural Engineering.

J. W. Hancock, of Charleston, has been chosen by the County Court for County Highway Engineer of Monroe County, West Virginia. The county will establish the patrol system on its roads.

Chas. S. B. Henry, County Engineer of Pacific County, Washington, has not assumed the office of City Engineer of South Bend, Wash., as stated in last week's issue, this notice having appeared through an error. G. G. Hall is City Engineer of South Bend.

EQUIPMENT — TRADE — MATERIALS

"Erie Revolving Shovels"

Bulletin S-16, issued by the Ball Engine Co., of Erie, Pa., is an illustrated booklet containing a large amount of information relative to the construction of Erie revolving shovels and their use on various kinds of work. The data include notes on equipment, specifications and an estimate of operating cost. The Erie automatic crowding device, the 3-lever automatic control, the adaptability of shovels and other advantages of their use, are explained and shown in half-tone illustrations.

The booklet is 8½x11 in. in size and the quality of paper on which it is printed shows the illustrations to the best advantage.

Milwaukee Chain-Driven Concrete Mixers

The above is the subject of a 38-page booklet, designated as Bulletin No. 20 of the Lakewood Engineering Co., manufacturer of mixers for building and heavy construction. The matter contained in the text in addition to general descriptions gives the specifications of the Milwaukee building mixers of capacities of from 10 cwt. to 100 cwt. Different views of the machines, with mountings, and the equipment and appliances used with them are clearly displayed in a number of very excellent half-tone illustrations.

Data relating to the quantity of materials required per cubic yard of concrete and other essential information is given in the booklet which is 8½ by 11 in. in size, and may be obtained from the Lakewood Engineering Co., Cleveland, O.

"Motoring Through the Keystone State"

A very attractive booklet has been issued by the Atlantic Refining Company, of Philadelphia, Pa., under the above title. Its purpose, as stated in the foreword, is to point out to tourists the many places and objects of interest in Pennsylvania, and to emphasize the history and the natural and industrial features of the state. The booklet is 5¼ by 6¾ in. in size, and contains 42 pages and covers, almost every page presenting an excellent photographic illustration of scenes in various parts of the states, among them being views of improved roads. The Atlantic Refining Co. sends out with this booklet a "courtesy card" which entitles the bearer to the courtesy and consideration of its employees wherever they may be found in Pennsylvania.

The Orenstein-Arthur Koppel Co., of Chicago, Ill., has signed a contract for the shipment of a complete hauling outfit consisting of Koppel portable track turnouts, V-shaped dump cars, and locomotives, to A. G. Trippeer, of Peru, Ind., who has a contract for road construction in Monroe County, Michigan.

The Sullivan Machinery Co., of Chicago, Ill., has moved its San Francisco office from the Sheldon Building, No. 461 Market St. to the Hobart Building, No. 582 Market St. The announcement of this change of address in the issue of July 14 was in error. Ray P. McGrath is Manager of the San Francisco office.

The Asbestos Protected Metal Company of Pittsburgh, Pa., has announced the temporary closing of its Cincinnati office on Aug. 1, because of the entrance of E. G. Irwin, the Cincinnati Manager, into the National Guard. It is stated that communications should be addressed to the home office of the Company, First National Bank Biulding, Pittsburgh.

The Use of Convict Labor on a California Road needed for military purposes has made it possible to improve a link in the state highway system for which no appropriation had been made. The road is required for a military camp under construction, and funds for its improvement were available from the camp appropriation, according to the report, but the work was greatly aided by the fact that a large number of convicts could be assigned to it, under a foreman accustomed to handle such labor. The instance is cited as another example of the successful use of convicts in California and to show how part of the road building work of other states can be done in spite of the present scarcity of labor.

GOOD ROADS

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State Highway Work in Oregon

The State of Oregon has a land area of 95,607 sq. mi., an extreme breadth (east and west) of about 375 mi., and an extreme length (north and south) of about 290 mi. The estimated population on Jan. 1 of this year was about 850,000.

Topographically, the state would be described as mountainous, that term applying to practically all of the state except the central part and a portion of the southeastern section. The main trunk highways follow the valleys and require considerable heavy work. The Pacific Highway, running from Portland south to about the middle of the state, up the Willamette Valley, is on a fairly easy grade. Through the lower half of the state, the road leads into the mountains and requires heavy work at numerous places. This mountainous condition is one of the features which has made the beauty of the Oregon country so well known throughout the country.

West of the Cascade Range there is much rain in the winter and in the summer the days are hot and the nights cool. East of the mountains in the northern portion of the state, the winters are cold and there is considerable snow. In the southeastern portion of the state, there is a large area in which irrigation is necessary for the raising of crops. There is very little rainfall here either in winter or in summer, and but very little snow. The days are hot and the nights cool in summer.

From a road material standpoint Oregon is in fair shape. In the western part there is plenty of gravel for road purposes and in most parts of the state the necessary sand for concrete or asphaltic paving can be secured. There are also numerous deposits of rock suitable for macadam. In eastern Oregon the water supply is rather short in some places. Sand and gravel are also lacking in many parts of this section, but there are generally available fairly good deposits of rock for macadam. In central Oregon there are large deposits of volcanic cinders which are used with fairly good results in subgrade work. The cinders are very easily loaded, are light and easily handled. There is also a pumice rock in this section of the state that is used to some extent as a dressing on the roads.

According to the statistics of the Office of Public Roads and Rural Engineering of the U. S. Department of Agriculture ("Public Road Mileage and Revenues in the Central, Mountain and Pacific States, 1914"), the state, at the close of 1914, had 36,819 mi. of public roads, of which 4,716.4 mi., or 12.81%, were surfaced. "Of the surfaced roads," the

AN IMPROVED ROAD EAST OF PORTLAND, OREGON—WARRENITE PAVEMENT.

VIEW ON AN UNIMPROVED SECTION OF THE PACIFIC HIGHWAY IN THE SISKIYOU MOUNTAINS.

VIEW ON A MACADAMIZED SECTION OF THE ROAD SHOWN IN ILLUSTRATION AT THE LEFT.

statement continues, "1,000.72 mi. were macadam, 137.25 mi. bituminous macadam, 3,060.15 mi. gravel, 179.50 plank, 300 sand-clay, 28.41 concrete, 10 volcanic cinders, and 0.37 wood block. There were also reported 4,718.75 mi. of graded and drained earth road. The total of all public roads in 1909 was 29,475 mi., of which 2,799.25 mi., or 9.49%, were surfaced, an increase in surfaced mileage in the 5-year period of 1,917.85 mi."

These figures, of course, do not include roads and streets in incorporated cities and towns.

A highway department was created in Oregon by the Legislature of 1913, the law becoming effective in June of that year. The law provided that the department be allowed a ¼-mill tax on each dollar of assessable property in the state, effective Jan. 1, 1914, and there was also appropriated $10,000 for the maintenance of the department from June, 1913, until the ¼-mill fund should become available. During the year 1914, this tax amounted to approximately $240,000.

The law also provided for cooperative work between state and county and gave the counties authority to turn over their funds to the state organization for expenditure, it being the theory that on account of the state's highly trained force of men, the counties would get greater value by having their money expended by this force.

During the period from Jan. 1, 1914, to Dec. 30, 1916, there was expended for road and bridge work the sum of $625,500 from state funds and $1,325,000 from county funds. The cost of operating the department during this period was $63,000 or a trifle over 3% of the total expenditure. This does not include, however, engineering or construction or location, but does include the expense of the bridge department, which is required by law to make plans and specifications for bridges, as called upon by the various county courts, without charge to the counties. This has cost about $6,500 annually for the past two years.

The law creating the Highway Commission designated the Governor, the Secretary of State, and the State Treasurer as members of the commission. These officials also form the Board of Control of the state, and altogether, aside from the duties for which they are primarily elected, serve on about eighteen other boards and commissions, thus making it physically impossible for them to give highway development the attention that its importance merits. The demand for highways in the state has become greater and greater and the commission recommended very strongly to

VIEW ON THE COLUMBIA RIVER HIGHWAY IN HOOD RIVER COUNTY—BEFORE CONSTRUCTION.

COMPLETED ROAD AT POINT SHOWN IN THE ILLUSTRATION AT THE LEFT.

the 1917 Legislature that there be created a new commission that could give much of its time to this important work. After much study the Legislature of 1917 passed an act providing for a non-salaried highway commission of three members who were to be appointed by the Governor from the three congressional districts, and also passed other bills changing the road laws of the state.

S. BENSON,
Chairman, State Highway Commission.

W. L. THOMPSON,
Member, State Highway Commission.

Highway Officials
of the
State of Oregon.

E. J. ADAMS,
Member, State Highway Commission.

G. ED ROSS,
Secretary and Auditor.

HERBERT NUNN,
State Highway Engineer.

The new State Highway Commission Law (Chapter 237, General Laws, 1917) provides for the establishment of a state highway commission, the appointment of a state highway engineer and other members of the State Highway Department; defines the powers and duties of the commission and the engineer, and makes other provisions for the construction, improvement and repair of state highways.

The law defines the terms "road" and "highway" as including the necessary bridges and culverts, and not including city streets, and defines "state highway" as meaning any road or highway designated as such by the commission or by law. The term "county court" is defined as including all county officers or boards having in charge the construction, maintenance and repair of roads and bridges. The state "highway department" is defined as consisting of the state highway commission, the state highway engineer and all their employees.

The State Highway Commission, created by the law, consists of three members appointed by the Governor, one member from each congressional district of the state. The commissioners hold office for three years, except that of the first three appointed, one holds office until March 31, 1918, one until March 31, 1919, and one until March 31, 1920. The commissioners receive no salaries, but are allowed traveling and other expenses incurred in the performance of their duties. Each furnishes a bond of $5,000.

The law stipulates the calling of a meeting of the commission by the Governor, as soon as practicable after the passage of the law, for the selection of a chairman. The law directs the commission to appoint a state highway engineer "who shall be a competent civil engineer and qualified by a technical training as well as practical construction experience in highway work." The engineer holds office during the pleasure of the commission, but may not serve for more than four years without reappointment. His salary is fixed by the commission, but must not exceed $5,000. He also receives traveling and other necessary expenses. He is obliged to give a $10,000 bond.

The law also authorizes the commission to employ such clerks and other assistants as may be necessary, leaving the fixing of salaries and terms of office to the commission, with the provision that the total cost "of maintaining the commission for salaries or other overhead expenses" during any one year shall not exceed 10% of the funds available to the commission for its work during that year.

The section prescribing the powers and duties of the commission authorizes the commission to make such rules and regulations as may be necessary and provides that the commission shall meet as may be necessary for carrying out the provisions of the act. The commission is given supervision over all matters pertaining to the construction of state highways, including the letting of contracts and the selection of materials to be used. The commission must publish an annual report to the Governor, containing the report of the engineer and such other information as may appear desirable. It is also provided that the commission "shall designate, construct or cause to be constructed a system of state highways within the state of Oregon, which highways shall be designated by number, and by the point of beginning and terminus thereof." The State Highway Department is also authorized to act for the state in carrying out the provisions of the federal aid road act.

This section also pledges the good faith of the state "to make available funds sufficient to equal the funds apportioned to the state by or under the United States Government during each of the five years for which federal funds are appropriated by Section 3 of said act, and to maintain the roads constructed or improved with the aid of funds so appropriated, and to make adequate provision for carrying out such maintenance." It is also provided that the state shall make available an amount which, combined with the funds made available by the several counties, will equal the sum apportioned to the state under the provisions of Section 8 of the federal aid road law.

The sections defining the duties of the highway engineer are in part as follows:

> The state highway engineer shall keep a record of all proceedings and transactions of the highway department, and shall, so far as he is able under the provisions of this act, compile statistics relative to the public highways throughout the state, and shall collect all information in regard thereto which he may deem important. Said engineer shall keep on file copies of all plans, specifications and estimates prepared by his office. He shall cause to be made and kept in his office a general highway plan of the state, and shall collect information and compile statistics relative to the mileage, character and conditions of the highways and bridges in the different counties in the state. Said engineer shall, under the direction of the commission, investigate and determine the methods of road construction best adapted to the various counties, giving due regard to the topography, natural character and availability of road building materials and the cost of building and maintaining roads under the provisions of this act. Said engineer shall prepare surveys, plans, specifications and estimates for the materials to be used in and the manner or method of construction of any highway constructed under the provisions of this act, subject to the approval of said commission, and in advertising for bids on any such highway it shall be the duty of the commission to invite bids in conformity with such plans and specifications. Such advertisement for bids shall be in accordance with the regulations adopted by said commission, but awards of contracts for the construction, improvement, repair or maintenance of said highways shall be made by said commission to the lowest and best responsible bidder upon the kind of material or materials selected by said commission; provided, however, that any or all bids may be rejected if it appears to the best interests of the state. If no satisfactory bid is received, new bids may be called for, or the work may be done without letting to contract, as may be determined by the commission. On work involving an expenditure of less than two thousand dollars ($2,000.00) it shall be discretionary with the highway commission whether such construction, improvement or repair shall be let by contract or be performed by day labor. On such work performed by the state by day labor the engineer shall be held responsible for the economical prosecution of the work.
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> Said engineer shall keep an accurate and detailed account of all moneys expended in the construction of all highways and roads which are constructed under his general supervision, direction and control, and shall keep a record of the number of miles so constructed in each county, the date of construction, the width of such roads and the cost per mile of construction. On all state highways and on county roads constructed under his supervision a simple but adequate accounting system shall be installed in order that all expenditures and costs may be classified as the work progresses. Partial payments shall be allowed and made on contracts for highway improvement based upon estimates prepared and certified to by the engineer and approved by the commission, but not more than eighty-five (85) per cent. of the contract price of the work completed shall be paid before the completion of the contract and its acceptance by the engineer; but no such payment shall be construed as acceptance or approval of such work or waiver of any defects therein.
>
> On or before the tenth day of each month said engineer shall make a report to said commission of the work done during the preceding calendar month, and of the progress of all work which he may have in charge. He shall also prepare proper vouchers covering claims for all salaries and expenses of his office and other expenditures authorized by the commission. Such claims as may be approved by the commission shall be indorsed by it and presented to the secretary of state for audit in the same manner as other claims against the state.
>
> Employees may be paid by a payroll, said payroll to be prepared by the engineer, who shall set forth the name of each employee, the rate of salary or wages, the capacity in which each person is employed and the amount due each employee. Such payroll shall be verified by the engineer and approved by a majority of the commissioners. It shall be the duty of the secretary of state to audit such payroll and draw a warrant on the state treasurer for the aggregate amount allowed thereon, in favor of the engineer, whose duty it shall be to deposit such warrant in a reputable bank and immediately pay over the moneys received thereon to the several parties entitled thereto. Payroll chcks issued by the engineer after having been properly indorsed and paid shall be filed in the office of the commission and shall constitute a full receipt of payment for services rendered. In addition to his official bond the engineer shall furnish a payroll bond in such sum as the secretary of state may direct, not less, however, than the aggregate of the payrolls for the month which the same may cover, the cost of said bond to be paid by the state. The payroll bond herein required shall be filed in the office of the secretary of state.

The law also directs the engineer to make a report to the commission on the first of December of each year, and to prepare to accompany the report a map showing the work performed to the date of the report, particularly that done under the provisions of the federal aid law.

The highway engineer must act in an advisory capacity to the county courts and may be consulted by them in matters of road construction and maintenance. He must also furnish specifications for work when requested to do so. The engineer may also call upon the county court of any county for information on the road work in its vicinity and this information must be furnished him. A county desiring to construct or improve a state road within its boundaries must obtain the location and grade of the road from the state highway engineer. In such cases, the cost of establishing the location and grade is charged to the road on the books of the State Highway Department as a part of the cost of construction.

If satisfactory bids cannot be obtained for doing work by contract, the commission may have the work done by day labor or by convict labor. In any case the work is done under the direction of the State Highway Engineer.

The rights of way for highways and roads improved or constructed under the act, must be acquired by the counties in which the highways are situated "by either donation, purchase, agreement, condemnation, or through the exercise of the power of eminent domain by the county" before the letting of the contract. If the county neglects or refuses to acquire the right of way, the state may do so, through the commission, in the same manner as the counties.

Sections governing the supervision of work and the maintenance of state highways are as follows:

> All construction work done by counties upon any of the state highways to which the state contributes not less than 25% of the cost of construction shall be subject to the supervision of the State Highway Department.
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> All moneys raised by counties for road purposes, and expended or to be expended upon roads within such counties other

(*Continued on page 72.*)

Paving and Road Building*

By **MANLEY OSGOOD**†

The first pavements constructed in Ann Arbor were laid in 1898 and 1899. Bricks on concrete foundations were used, with soft filler between the brick. This pavement will be 20 years old next summer and is is fair condition for a pavement of that age, although somewhat rough, due to unequal settling of the individual bricks.

From 1900 to 1903, inclusive, asphalt block laid on nothing but compacted sand and gravel foundation was tried, 32,500 sq. yd. of this type being laid on some of the heaviest traveled streets in the city. As early as 1908 it was realized that some measure must be adopted to preserve this pavement, and it was given a carpet coating of tar and sand. The tar and sand adhere very well to the asphaltic surface of this block, and carpeting has prolonged the life of this type of pavement many years. On these streets such a coating lasts for about four years. It may be said right here that Ann Arbor learned that any necessary patching of a pavement should be done with the same material as that of the pavement to be patched. The repairing of asphalt block streets with vitrified brick or concrete was an absolute failure.

In 1913 one city block of this type of pavement was replaced with standard vitrified brick on a concrete foundation. In 1916 the second block was replaced, and this year a third block is being replaced. These blocks are in downtown districts where Ann Arbor's heaviest traffic prevails. It is proposed that in districts where the traffic is not so heavy the asphaltic block be used for a foundation to be surfaced with asphaltic concrete or sheet asphalt.

From 1909 to 1914, inclusive, the more or less famous Ann Arbor tarred concrete or "Dollarway" pavement was laid exclusively. The first pavement of this type was constructed on Maynard St., is one block long and contains 1,880 sq. yd. The materials were purchased and the work of construction done by the city and every precaution was used to procure good results. This pavement was laid for $1.03 per sq. yd., including curbing and grading or for 78 ct. per sq. yd. for the pavement only. It had been quite difficult to obtain the necessary majority signatures for a pavement previous to this time, but when the news spread that this pavement had been constructed so cheaply, petitions commenced pouring into the Common Council from all parts of the city, and all expressed preference for a pavement similar to that on Maynard St. The result was that the city started paving streets as fast as possible with the machinery and labor available. In the next two years, 1910 and 1911, during which 58% of all of this type of pavement now in the city was laid, everything was sacrificed to first cost. The small batch concrete mixer used on Maynard St. was replaced by a continuous mixer of greater capacity. Cement was never tested unless it was very evident that it did not come up to the specifications. Bank run gravel was used in both courses, without screening or washing, and especially in 1911, when the greatest yardage was laid, there was not sufficient or sufficiently competent supervision or inspection to insure even the best obtainable bank run gravel. The pavement was reduced from a total thickness of 7 in. to a total thickness of 6 in., making the lower course 4½ in. thick and the upper course 1½ in. thick. During these two years this type of pavement was promoted throughout the entire country. The low cost was the most advertised feature, and the results obtained in Ann Arbor were used as examples of remarkable savings.

As I said before, after the completion of the Maynard St. pavement, the people of Ann Arbor were very enthusiastic about this type of pavement. It continued to grow in favor in 1910 and 1911; then the tide commenced slowly to turn. It became evident to all that it was necessary to recarpet the concrete every two or three years, in some cases, varying with traffic conditions, even every year. Those who owned automobiles did not like the throwing up of the tar and sand on the under side of the fenders. In some places, where the carpeting peeled off, the concrete commenced to ravel, and sections, varying in size, had to be cut out and replaced with better material. It was then realized that reducing the first cost to a minimum had caused a heavy burden of maintenance and repair. These pavements must be kept carpeted to preserve the concrete underneath as long as possible.

In 1913 and 1914 the same type of pavement was laid, but greater precautions were taken in the selection of material. During the latter year only washed sand was used in the top course. Results show that the greater care and increased cost were justified.

In 1915 the city returned to standard types of pavement. Reinforced concrete, asphaltic concrete on cement concrete foundation, and vitrified brick on concrete foundation have all been laid with very good results. A further change was made in 1915 from municipal to contract work. Inspection of all material and workmanship has been very rigid except for three blocks of asphaltic concrete surface. Due to the resignation of an inspector before the completion of this street and the inability to find a man to replace him, the last three blocks of asphaltic surfacing were laid with only intermittent inspection. These three blocks have developed surface holes due to insufficient thickness of surfacing in some cases and improper mixture in others, while the remainder of the district, some 14 blocks, is in excellent condition. The concrete base, as seen through these holes in the asphaltic surfacing, is in excellent condition and a very good grade of concrete. The defective surface has been once and must be again repaired under the condition of a 5-year maintenance bond.

From the foregoing, it may be seen that Ann Arbor has passed through the same stages of paving development that are experienced in many American cities. These experiences can lead to but the following conclusions: That good materials and proper methods, as well as careful workmanship, must be used to make a good pavement of any type, and that the pavement cheap in the first cost is quite apt to be considerably more expensive in the final accounting. Concrete pavements as a class are not condemned by us because of those constructed in 1910 and 1911. We believe that each type of pavement has a place, and it is the business of the municipal engineer to know where each type belongs. The wishes of the property owners should be given consideration, but should not be the deciding factor in the choice of kind of pavement for any particular street or district.

The improvements in the standard types of paving during the past few years have not been very numerous. In concrete paving, better aggregates are being insisted upon, and in some cases, richer mixtures. There have also been several improvements in the finishing of concrete pavements, one of the latest ones being by means of a broad leather belt moved transversely across the crown of the street. In the brick pavement, the wire-cut brick with square edges was introduced several years ago, but has only within the last two years become very generally used. The square edges and rough side surfaces of this brick are quite an improvement over the old repressed type. During the past year also the monolithic and semi-monolithic types of brick pavement have been developed. In these, in place of the sand cushion formerly used, the brick are laid either directly upon the green concrete foundation or upon a mortar bed. This type of pavement—for it is really but one type—properly constructed has the following advantages over the former type where the concrete base and brick surfacing were separated by the sand cushion:

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*From a paper presented at the 19th annual convention of the League of Michigan Municipalities, Grand Rapids, Mich., July 26-27, 1917.

†City Engineer, Ann Arbor, Mich.

First: It insures that the rolling and grouting of brick will follow closely after the laying.

Second: It insures a firm and separate bearing for each brick.

Third: It eliminates the danger of sand floating or being squeezed up into the joints, thus preventing the proper penetration of grout filler. This does away with many of the transverse cracks and the sections where the brick are not properly bonded, faults which were quite common in the former type of brick paving.

Fourth: The monolithic construction eliminates the necessity for marginal curb on country roads.

A method of construction of brick pavement on hillsides, known as the "dual" type, has been developed comparatively recently. A strip 7 or 8 ft. wide along each side of the improvement is laid with "hillside" blocks which give a corrugated effect to aid horse-drawn traffic. The center of the improvement between these two strips is laid with the ordinary smooth brick and is intended primarily for automobile traffic. This type of construction separates very effectively the slow and rapid moving traffic.

In one of our Michigan cities this year is being tried a novel type of construction. A pavement 18 ft. wide, in this case of asphalt confined between headers of concrete built as a part of the concrete foundation, is constructed along the center of the street and the strip along each side between this pavement and the curb is built of earth or gravel, as are the shoulders of the paved country roadway. It will be watched with interest to see if this type of construction is adapted to the traffic on a city street.

The road building of a municipality, as distinguished from paving, is largely the preparation and maintenance of unpaved streets. In and about Ann Arbor gravel is plentiful and road building is, therefore, limited to the spreading of gravel over the surface of the road to be improved, leaving it for traffic to roll down. If the gravel surface wears full of holes, another gravel surface is applied, until, in many cases, the roadways have been built, in just this manner, higher than the sidewalks on either side. The correct method of building and maintaining such streets or roads is much the same whether the surfacing material or "metal" be gravel, broken stone or some other suitable local material. If the street to be improved is not curbed, or if the graveling or improving is not to be carried from curb to curb on a street that is curbed, shoulders should be cut the proper distance apart to provide for surfacing the width desired. The gravel should be spread evenly between the shoulders or between the curbs as the case may be, with all the larger stone or coarser gravel at the bottom and the finer material on top, and in such manner that it will pack uniformly. The entire road surface, from curb to curb or from side ditch to side ditch, should then be rolled, commencing at the sides and working toward the center. When holes appear in the gravel surface, they may often be cared for by cutting square edges about the hole and filling with gravel, tamped in; but it is useless to throw small quantities of gravel into these holes without cutting the edges square. When the surfacing becomes sufficiently worn or raveled to require re-graveling, which, if the ordinarily traveled street is properly constructed and maintained, will not be for several years, the fine dust should be scraped from the surface, the gravel or "metal" should be scarified and loosened, the necessary amount of fresh gravel or stone spread over the surface, and then the whole rolled until it is properly consolidated into an even surface with the proper crown and at proper grade or elevations.

The most important part of road building or road making—and I speak of roads as distinguished from pavements—is the dragging or floating. Even an earth road, if dragged frequently after each rain until the surface becomes dry enough to prevent rutting, may be kept in very good condition. The department in charge of the maintenance of unpaved streets should be provided with a sufficient number of these drags or floats and they should be used after every softening of the road surface until the surface is again hard enough to prevent rutting. This frequent dragging or floating of the road is the most important measure of maintenance and the one which will give the best and most apparent results for the money expended.

It is admitted that the first cost of preparing the road in the manner above outlined is more than if less care is used, but the results in the length of wear and convenience to traffic will more than justify the additional expenditure.

In this present crisis, which three and one-half years ago we would have said was an impossibility in the twentieth century, there is great need for continuing work of this nature as before this condition of affairs arose. It is impossible to foretell what turn this will take or how long it will be before peace is restored. It is even impossible to tell how long after peace is restored it will be before things again resume their normal condition. It is, however, a physical impossibility to generally "speed up" work of this nature and maintain even the present conditions of labor and material prices.

Two Highway Bills Introduced in Louisiana Legislature

A measure providing for the expeditious handling of road building materials by transportation companies, has been introduced by Representative A. M. Smith in the Louisiana House. This bill seeks to place such materials on the preferred list. It has the support of State Highway Engineer Duncan Buie.

The other bill asks for the transfer of about $4,500 remaining in the State Treasury from the 10% allowed for collecting and handling automobile license taxes, to the State Highway Board for use in highway construction.

Five Hundred Convicts to Work on Missouri Roads

A working arrangement is being perfected by the State Highway Board and the State Prison Board, which will make it possible for counties in Missouri to use convicts on the public roads to advantage. Necessary machinery and camp equipment will be provided, and counties or civil subdivisions will be required to pay a flat rate per man employed. It is expected that the rate will not exceed $1.50 per day. This will include the cost of guarding and feeding all men in camp.

There are several hundred able-bodied convicts in the Missouri penitentiary now available for road work, and the Governor has directed that 500 of these be placed at the disposal of the state highway commissioners for use in improving the 3,500 mi. of state highways which have been planned. It is pointed out that convicts can be used to advantage in many counties in grading around bluffs or steep hillsides in the relocation of roads now in bottom lands, and in the operation of rock quarries and gravel pits.

GOOD ROADS

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

AUGUST 11, 1917

PROVISIONS FOR THROUGH TRAFFIC IN CITIES AND TOWNS

Detours making it possible for a motorist to avoid the main business thoroughfares in passing through towns and cities were suggested some time ago in these columns as a means of relieving traffic congestion in business centers. As traffic grows in volume, the plan appears more and more adapted to present-day needs, especially in the smaller cities.

The street system of the average city of moderate size is the result of more or less haphazard growth, not the fruit of a careful study of present and future needs made at a time when it would have been possible to carry out a well-planned development at moderate cost. Before the coming of the motor car these street systems—if they can be called systems—served their purpose fairly well. The traffic they had to carry consisted of horse-drawn vehicles which, excepting those used for purely local purposes, followed routes between the center of the town and the outlying country. This traffic moved slowly and there was little difference in the speed of individual vehicles, so that there was no congestion resulting from the holding back of the faster traffic by the heavier, slower vehicles.

Present traffic conditions in such communities are entirely different. There is still the travel between the city and the surrounding country, but, in addition, there is in most places, especially during certain seasons of the year, a very considerable traffic made up of motor-driven vehicles passing through the city. Because the systems are composed primarily of roads radiating from the center, the natural route of travel through the town is through the business center. The inevitable result is a congestion of traffic at one or more points where the local travel is the heaviest.

As a rule the automobilist passing through town has no object in going through its business center. If other routes were available the average driver would probably prefer them, provided they enabled him to get through the town in less time. This would also work to the advantage of local traffic.

In most cities it would be comparatively easy to provide detours of this kind. It would mean that the improvement of the streets would have to be carried out with a view to providing a route at least as well paved as that leading through the center, and it would also mean that the detours would have to be clearly indicated by markers of some kind. The latter could well be taken care of by local automobile organizations, cooperating with the city or town authorities.

ANOTHER CASE OF POLITICS

The resignations of L. D. Smoot and John E. Ballinger. which we note briefly elsewhere in this issue, are said by those in a position to know the facts to furnish another example of the retirement of able officials through political causes.

While we know nothing of the men who are to succeed these gentlemen, we deplore the state of affairs which so frequently results in changes of highway officials for no reason except that their politics are not "right." It is said that the duties of Messrs. Smoot and Ballinger are to be assumed by a board of laymen of various occupations none of which carries with it any suggestion of qualifications for carrying on street work. If this is true, it adds force to the supposition that the only fault to be found with Smoot and Ballinger was their politics.

There is no reason whatever for the injection of partisan politics into the management of a city's street work. When, as in this case, men have proved their ability to handle such work in an efficient and economical manner they should be retained in office regardless of other considerations. Efficiency and economy have no connection with politics and the city administration that puts party above ability can never hope for good results.

ROAD CONTRACTORS AND THE CAR SHORTAGE

A partial remedy for the shipping difficulties which have confronted road contractors for some time past is indicated in the report of a hearing before the Car Service Commission which is noted elsewhere in this issue.

Readers of "Good Roads" will remember that a meeting of men interested in road building was held at the Automobile Club of America early in June for the discussion of various matters of interest to road builders that had become pressing since the entrance of the United States into the war. One of the chief results of the meeting was the taking of steps to bring before the proper authorities the difficulties experienced by contractors and others in obtaining supplies by rail. As noted, this matter was brought to the attention of the Car Service Commission late last month and the procedure recommended by the committee after the hearing is set forth in some detail in the report made by members of the committee.

Briefly stated, the recommendations are that the maximum efficiency be sought for in the use of cars and that such delays as occur be reported to the commission with full information on each case and such recommendations as may occur to the complainant. It is pointed out that any relief obtained must come through some such method as this rather than an increase in the number of cars, the latter under existing conditions being impossible.

This plan, if consistently followed, should go far toward relieving the present situation. If a way can be found to do it, it would also seem well for road builders to bring pressure to bear, through the Car Service Commission or in any other way open to them, upon other users of cars, to the end that there be less delay in unloading. This has frequently been cited as one of the chief causes of car shortage and the fault has seldom been that of road contractors or others engaged in road work.

State Highway Work in Oregon

(*Continued from page 68.*)

than state highways, shall be under the exclusive control of the county court of such counties. Nothing in this act contained shall be construed so as to prohibit the county from cooperating with the federal government under Section 8 of the federal aid road act for the construction and maintenance of roads in or partially within the national forests. No part of the state highway fund shall be expended upon other than state highways.

The maintenance of state highways constructed or improved under this act shall be under the supervision of the highway department, on such terms as may be mutually agreed upon between the commission and the county court of any county; provided, however, that the counties shall not pay more than 50% of such maintenance cost.

A state highway fund is provided for by the law by means of a state levy of ¼ mill on each dollar of assessable property in each county. This is to be collected by the county and paid to the state treasurer and is designated as the "state highway fund." This fund is at the disposal and subject to the use of the State Highway Commission for the purpose of carrying out the provisions of the act. The apportionment of this fund is provided for as follows:

The commission shall first set aside from the highway fund of the state an amount sufficient for the salaries and expenses of the state highway department; then a sufficient amount to cover the cost of operating and maintaining state highways which have been constructed or improved; then sufficient funds to meet the federal government appropriation and requirements of Section six (6) and eight (8) of the act of Congress referred to in Section three (3), Article one (1) of this act, or any federal appropriation that may be hereafter provided; then the remainder shall be used for any purposes of this act, and the state highway commission is hereby authorized to enter into cooperative agreements and undertaking with any county for the survey, construction, improvement, reconstruction, repair or maintenance of any state highway or part thereof upon such basis of contribution as may be agreed upon between them; provided, however, that any amounts or sums as individual counties have acquired through the issue of bonds and expended since May 1, 1913, on roads that are now or may hereafter be designated as state roads, or sections thereof, shall be considered and treated as having been contributed by such county under any cooperative agreement hereafter entered into between the state and the county.

This act was approved by the Governor on Feb. 19, and became effective on that day.

Another law passed by the 1917 Legislature gives formal assent to the federal aid road act, designates the body having charge of state highways to administer work under that law and makes the following provisions for meeting the federal appropriations:

The state board, commissioners, or officers having control of the state highways of the State of Oregon shall, out of the money received in the highway funds of the State of Oregon each year, first set aside a sufficient amount to comply with the terms of said federal act, and if there is any deficiency in said highway fund for such purpose then the State Board of Control of the State of Oregon is hereby authorized, empowered and directed each year during the next five years to sell the bonds of the State of Oregon in an amount sufficient to raise enough money which, taken together with any money available from appropriations from other funds of the State of Oregon, if any there be, to equal the amount required of the State of Oregon in order to fully meet the requirements, conditions and provisions of said federal statute, and the federal officials operating under said statute; provided, however, that such bonds shall not be issued unless necessary to enable the State of Oregon to avail itself of the federal aid as provided hereinabove or any other aid hereafter furnished by the United States.

The bonds provided for in the foregoing must not run over 20 years and must bear interest at a rate not exceeding 4% per annum, payable semi-annually.

Another law requires the State Highway Commission to adopt standard specifications for hard-surfaced pavements, including "asphaltic concrete pavement and hydraulic concrete pavement." It is stipulated that these specifications must not infringe any patented pavement and there are included the following provisions relative to special pavements, patented or otherwise:

Any person, firm or corporation in response to the notice and advertisement for bids referred to in Section 2 of this act may under the conditions imposed upon bidders in the notice inviting such bids or by law, submit a proposal and bid to make the improvement with a patented pavement, or unpatented pavement of special design of the character and type described in such notice that every such proposal and bid to make the proposed improvement with a patented pavement or unpatented pavement of special design shall be accompanied by and there shall be submitted therewith specifications for laying and constructing such patented pavement or unpatented pavement of special design, providing the quantity and proportion of the several materials and ingredients composing said patented pavement or unpatented pavement of special design, and the kind, quality and standard of materials and ingredients to be used therein and providing that the quality and standard of such materials and ingredients shall be determined and tested in the manner provided by the standard specifications of the state highway commission and shall also provide the manner of laying and constructing the pavement and mixing and preparing the materials and ingredients thereof, all with the same minuteness of detail as is provided in the standard specifications of the state highway commission.

If in response to a notice or advertisement for bids for making any highway improvement any person, firm, or corporation shall submit a bid and proposal to make the same with a patented pavement, or unpatented pavement of special design, and after full consideration the state highway commission, county court or board of county commissioners as the case may be shall be of the opinion such patented pavement, or unpatented pavement of special design, with which such bidder proposes to make the improvement, is as good or better than the pavement provided for in the standard specifications of the state highway commission in durability and utility and the bid submitted is as low or lower, in the judgment of the state highway commission, county court or commissioner's court, taking into consideration the utility, material, and specifications submitted with any such bid, than any bid submitted upon said standard specifications, the state highway commission, county court or board of county commissioners may award the contract to the responsible person, firm, or corporation submitting the best bid in the estimation of the state highway commission, county court, or board of county commissioners, for making the improvement with such patented pavement, or unpatented pavement of special design; provided that the highway commission, county court or board of county commissioners may reject any and all bids.

Other laws passed by the Legislature included the following: "An act to provide for laying out, opening, establishing, constructing, improving, maintaining, altering, repairing, widening, grading, straightening, locating, relocating, legalizing and vacating county roads; providing for a board of county road viewers and defining its powers and duties; providing for roads of public easement, and the manner of laying out and improving the same; and matters necessary or incident thereto," and repealing certain sections of previous laws; "An act to provide for surveying, opening, constructing, improving, reconstructing, repairing and maintaining public roads" and repealing certain sections of previous laws, and an act defining unlawful combinations in procuring public contracts.

There was also passed a law providing for the issuance of bonds, not to exceed $6,000,000 in amount, for hard-surfacing and preparing for hard-surfacing certain designated highways. This bill was referred to the voters of the state at a special election on June 4 and was ratified by them. According to the terms of the law not more than $1,000,000 in bonds may be issued under the authority of the act during 1917, and not more than $2,000,000 in bonds "in addition to any surplus unissued or unexpended over the $1,000,000 authorized for the year 1917" may be issued during 1918. The bonds are to be sold during the next five years, and $600,000 of the bonds must be issued in denominations of $500 each, or less. The bonds issued in any year are to be payable "one-twentieth each year, commencing with the sixth year after the issuance thereof." The bonds are to bear interest at the rate of 4% per annum, payable semi-annually.

The highways, upon which the funds from the bonds issued are to be expended, are designated specifically in the act. There are also designated in the act certain other roads, as post roads and forest roads, which are to be paid for from the sale of bonds, as provided for in another bill passed by the 1917 Legislature, which provides for issuing bonds to the amount of $1,819,280.55 during the next five years to meet the federal apportionment for post and forest roads. These bonds are not to be issued, however, unless there is no other way to meet the Government funds.

A law regulating the use of motor vehicles and providing for registration and licensing, doubles the fees formerly collected under the motor vehicle law and turns the funds collected over to the highway department for use in meeting the federal apportionment to the state.

On account of the large area covered by the state and the great need of a large number of roads throughout that area, the road improvement has been confined almost entirely to a relocation of the general routes, fixing grade and alignment and constructing subgrade. A general system of trunk lines forming the state highways was adopted by the commission early in 1914. One of these is a road up the Columbia River from the Pacific Ocean to The Dalles, thence running easterly, bearing to the north, and crossing the Oregon-Washington state line at a point about 2 mi. east of Umatilla, Ore. The Columbia River Highway has a fairly good grade from Seaside through Astoria to Portland and then on from the Hood River County line to the city of Hood River, with one or two exceptions. Through the County of Multnomah, the highway was paved two years ago by means of a bond issue of $1,250,000, which Multnomah County voted. The Columbia River Highway east of Hood River has had only such attention as the county courts have seen fit to give it.

The Pacific Highway, leaving Portland, follows a general southerly direction to the California line. This road is for the most part passable, but still has a few bad stretches of road. In the Siskiyou Mountains there is a small section which has been paved with concrete and a larger portion that has been macadamized, and there are several stretches on which the counties have done some work.

The Dalles-California Highway, running south to the California line and dividing the state almost in half, has a new grade out of Bend, 17 mi. south, which was constructed last season. This is the only work the State Highway Commission has been able to do on this trunk line, but the counties have improved it somewhat. The road south of Bend will be covered with volcanic ash cinders.

The maintenance of the roads has been left almost entirely to the counties. This has been due to the fact that the great demand in the state has been for new construction, and the small amount of money available for the work that should be done made it absolutely impossible to provide for the maintenance of the highways constructed, and in most cases a promise to maintain new grades was secured from the counties.

Several of the counties voted large bond issues early in the history of the State Highway Department and turned the supervision of the work over to the state organization. Columbia County voted $350,000; Clatsop County, $400,000; Jackson, $500,000; and Hood River, $75,000. All of this money was spent on the Columbia River Highway except the $500,000 in Jackson County, which was largely spent on the Pacific Highway, a considerable amount on the Siskiyou Mountain grade and a stretch of paving from Central Point to Ashland, a distance of 9 mi.

In accordance with the new highway commission law, Governor Withycombe appointed S. Benson of Portland, W. L. Thompson of Pendleton, and E. J. Adams of Eugene, members of the State Highway Commission. The commission held its first meeting on March 6 and elected Mr. Benson chairman. G. Ed. Ross was appointed secretary and auditor. Later, Herbert Nunn of Portland was appointed state highway engineer.

Mr. Benson has long been identified with public affairs in Oregon and has taken an active part in road work. He came to the state from Wisconsin and engaged in logging, driving his own oxen and enduring the hardships inseparable from the occupation he followed. In 1880, while operating in Columbia County, his spring drive failed and he found himself without funds. He started anew and has accumulated a large fortune. During the past three years Mr. Benson has given very largely of his time and means to public institutions in his state. Among his gifts of money was about $90,000 given for road betterment.

Mr. Nunn, who has charge of the department's engineering work, is a native of Missouri and received his early education in that state and in Chehalis, Wash. He worked as a rodman on various engineering projects in 1896 and 1897 and in 1898 went to the Philippines as a private in Company E, 14th Infantry, U. S. A. He was discharged as a duty sergeant in Manila in March, 1900. After returning to the United States, Mr. Nunn was engaged on various engineering work until 1904, when he was appointed to the Infantry and Cavalry School, Staff College, at Leavenworth, Kan. He attended the school during 1904 and 1905, taking a special engineering and military course.

In 1906 Mr. Nunn went to Mexico, where he was engaged in exploration and mining until the following year when he became Highway Engineer of El Paso County, Texas. From 1910 until 1913 he served as City Engineer of El Paso, at the same time acting as consulting engineer to El Paso County in highway work. He resigned as city engineer in 1913 and again took over the county's highway work.

In August, 1914, he resigned and returned to the Northwest. He was appointed Highway Engineer of Multnomah County, Oregon, in April, 1915 and had charge of much of the work on the Columbia River Highway in that county.

Mr. Ross, Secretary and Auditor of the department, was born in Wisconsin and spent much of his time between 1900 and 1907 in the building materials line in Minnesota, the Dakotas, Iowa and Wisconsin. In 1907 he moved to North Yakima, Wash., and between that time and 1913, was identified with the Reclamation Service on the Yakima Valley Irrigation projects and in various departments of the service, finally becoming chief clerk and disbursing officer. In 1913 he was appointed chief clerk, paymaster and purchasing agent on the Tumalo Irrigation project in central Oregon. On the completion of this work he was appointed auditor of the Oregon State Highway Commission and later secretary and auditor.

Besides Mr. Nunn and Mr. Ross, the principal members of the State Highway Department are at present as follows: Bridge Engineer, C. H. Pursell; Designing Engineer, L. W. Metzger; Office Engineer, S. H. Probert; Assistant Engineers, W. E. Eddy, M. O. Bennett, and C. C. Kelly.

Concrete Highway Proposed for Western New York

The application of federal aid funds to the construction of a highway extending from the Pennsylvania state line to Silver Creek along the lake shore in western New York is contemplated by the New York State Highway Commission, according to report. The road will be 34 mi. long, 20 ft. wide, built of concrete, at a cost of $20,000 per mi., or at a total estimated cost of more than $500,000. This expenditure will be met by federal and state funds in equal amounts of $200,000, the balance to be borne by the municipalities benefited by the highway. It is said that the improvement will depend upon the legislative appropriation made next year for road purposes.

Methods of Applying Bituminous Materials[*]

By G. CAMERON PARKER[†]

While a number of failures in the use of surface treatments of bituminous materials have been due to the use of unsuitable materials, a greater number of poor results can be attributed to carelessness and lack of knowledge in connection with the methods of application. A good material will seldom if ever produce the desired results with improper handling, while a material of inferior quality, if carefully and properly used, will, in many cases, give fair service. The strictest adherence to the principles involved in the application of these materials is necessary if success is to be attained in their use.

Cold Surface Treatments

In the case of newly built macadam roads it is not advisable to apply the bituminous material immediately following the completion of construction. The reason for this is the fact that for the proper bonding of the macadam a certain amount of moisture is necessary, and that the covering of the surface with a waterproof material prevents moisture from being absorbed into the surface and forming the required bond. While the water applied during the final stages of construction is essential, a new road derives great benefit from occasional showers of rain and moisture absorbed from the atmosphere.

While it is impossible to set forth any definite rule, no two sets of conditions being the same, it is generally understood that the macadam road should have carried traffic for at least one month prior to the application of even a cold surface treatment. This gives the bond in the road time to set up and any settlement in the surface will become apparent and can be rectified before the oil or tar is applied.

The fact that the road is eventually to be treated does not relieve the superintendent or foreman from any responsibility in connection with the details of construction. It is an infallible rule that the better the road is built the greater will be the effects of bituminous applications. The assumption that the material to be applied will aid in the bonding of the road surface is a forerunner of failure, as experience has proved. Nor will the application of these materials be effective in the case of an old road unless the surface is in a proper state of repair. The time to fill ruts and depressions is before the bituminous treatment, not afterwards.

A clean surface is essential; tar or oil applied to the road over a layer of dust and dirt is wasted and occasions discomfort instead of comfort to the travelling public. Surface treatments are for the prevention of the formation of dust as well as for the prevention of its removal from the road. Consequently, if the material is applied to a dusty road it is impossible for it to come in contact with the hard surface and its effect is almost entirely lost.

If the road to be treated is wide enough for two lines of traffic, one-half should be closed and signs posted stating that the road is being oiled and instructing traffic to proceed with caution. In the case of narrow roads they should be entirely closed to traffic for short stretches at a time and provision made for detours. It is impossible to properly apply bituminous materials on a road that is carrying traffic.

Providing the surface requires no repairs, or that these have been made, the road should be thoroughly swept. This does not mean a light sweeping with hand brooms, which removes the loose dust only, but a thorough cleaning, which removes not only the loose material from the surface, but also the dust and binder from around the top of the stone in the surface. Stiff stable brooms can be used, but better results wil attend the use of a horse-drawn street sweeper with a revolving brush. One sweeping should not be considered sufficient, but the operation should be repeated until the mosaic on the surface stands out clean and clear. Not till then is the surface ready for the tar or oil.

The materials usually come in tank cars of from 6,000 to 8,000 gal. capacity, except in the case of small shipments when the material is put up in barrels or steel drums. In the majority of cases tank car shipments are made.

In applying fluid bituminous materials a distributor wagon should be used; a water sprinkling tank is suitable but will have to be fitted with a spraying attachment with a control valve and openings of sufficient size to allow the uniform distribution of the material in the desired quantity. The length of the distributor should be sufficient to cover the entire surface in the case of very narrow roads, or shorter, in order that the application can be made in two or more strips on wide roads. There should not, however, be any part of the surface uncovered, and the distributor should always travel in one direction.

The applications should be made during warm weather, when the road is thoroughly dry and there is no indication of rain. While warm, the material will spread more uniformly and in the absence of moisture will penetrate and adhere more strongly to the road surface.

The quantity of material applied will depend on the grade used and the condition of the surface. From $\frac{1}{8}$ to $\frac{1}{4}$ of an imperial gal. per sq. yd. is the usual amount. A stretch of road should be measured, the area calculated, and the valve on the distributor regulated till the desired application is obtained. Experience is the best guide in this matter.

The advisability of applying a coating of clean sand or fine gravel will also depend on the conditions mentioned above. With some materials it has not been found necessary; with others it is required, in order to prevent the material adhering to the tires of the vehicles. Where it is applied, a period of several hours should elapse between the application of the oil or tar and the spreading of the sand, in order that the bituminous material may spread over and penetrate the road and "seal up." The sand when applied will then absorb any excess material and permit the road being opened to traffic earlier than when it is not used.

Hot Surface Treatments

The principles governing the successful use of materials for cold surface treatments are the same when the materials used are of such consistency that they require preheating. The chief difference is in the method of application.

Where small stretches of road are to be treated the material may be applied by hand. It will usually be shipped in drums or barrels and can be heated in small portable heating kettles, of which there are a number of types, and applied with hand sprinklers. Usually, however, the work is of such a size that tank car quantities are purchased and distributing wagons used. In this case it is advisable that the material be applied under pressure as by this means a greater bond with the surface of the road is obtained and the scrubbing action of the spray cleans the minute particles of dust, which it is impossible to remove otherwise, from the road.

The tank cars in which hot application materials are shipped are fitted with interior steam coils in order that the material may be heated quickly. It will be necessary to provide a small steam boiler, of approximately 20 hp. capacity, at the siding and connect it to the heating coils of the car. The length of time required to render the material sufficiently fluid to be transferred to the distributing wagon is approximately 48 hours, the transfer of the material to the distributor being accomplished by applying steam pressure to the top of the tank and attaching a pipe from the bottom of the tank to the distributor.

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[*] From "Bituminous Surfaces for Macadam Roads," Ontario Department of Public Highways, Publication No. 23, July, 1917; appendix to the annual report of the Department of Public Highways, Ontario, Canada.

[†] Engineer, Department of Public Highways, Ontario, Canada.

Distributing wagons are self-propelled or are designed to be drawn by the roller and are provided with heating coils to which the boiler of the roller is connected. This keeps the material hot and at the same time steam is utilized to secure the desired pressure at the nozzles.

The distributing arrangement may be in the form of nozzles which are controlled by valves, and apply the material in the form of fan-like jets, an ordinary sprinkler, or a hose with a nozzle may be attached to the distributing wagon and guided by hand. In each case skill and experience are necessary to obtain the proper application.

The quantity used in hot surface treatments may vary from ¼ to ½ an imperial gal. per sq. yd. of surface. The grade of material used, the condition of the road, and the thickness of carpet desired will govern this.

Shortly after the application of the material, as soon as it has had time to "seal up," the surface should be covered with a layer of pea gravel, clean stone screenings or very coarse, clean sand. This should be applied in small quantities and spread uniformly, an excess being avoided. The result should be a thin mat or carpet on the surface composed of the bituminous material and the fine aggregate.

A thick bituminous coat is not desirable as experience has shown that it will not adhere uniformly to the surface and will wave and shove under traffic. Better practice recommends successive applications in small quantities, which results in retaining on the surface of the road a thin, tough, impregnated film.

Surface Binders, Penetration Method

A bituminous surface, constructed by the penetration method, may be laid either on a new foundation or on an old macadam road, the traffic on which demands a surface of this type. If the entire work is new the bottom course of the road should be constructed according to the methods indicated in Publication No. 8 of the Department, entitled "Principles of Roadmaking." In the case of a road which has been under traffic for a number of years with resulting ruts and depressions the surface should be lightly scarified; with the grading machine the contour should be reformed; new stone or gravel applied; and rolling continued until an even, dense surface is obtained. On such a foundation a new wearing course, carefully constructed, will give excellent service.

Crushed stone of a size commonly known as "2-inch," but which should be more definitely specified as material, all of which will pass a 2¾-in. circular opening and be retained by a 1½-in. circular opening, should be used for the surface. The compacted depth of the surface course should be, in general, 3-in.; but, as circumstances will decide, a greater depth may be advisable. The minimum depth, however, should not be less than 3-in. The material should be spread on the surface of the foundation evenly and well compacted with a roller weighing at least 10 tons. All unevenness and depression should be eliminated and the surface brought to an even grade and crown. It is then ready for the application of the bituminous binder.

Binders are solid at ordinary temperatures and will, therefore, require heating before they can be handled. They will be shipped in tank cars fitted with internal heating coils and should be heated in the same manner as hot surfacing materials. The temperature to which asphaltic binders should be heated is between 200° and 300° F. and that for tar binders should be lower, between 200° and 250° F. The upper limit of temperature should not be exceeded as there is danger of injuring the material when this is done.

In order to obtain a penetration to as great a depth as possible a pressure distributor should be used, pressure being obtained by means of a pump, in the case of self contained distributors, or by steam, when a distributing wagon is drawn behind the roller. Pressures used will vary with the type of distributor, but should be in the neighborhood of 50 lb. per sq. in.

When it is necessary to apply the material in successive strips great care must be taken that the strips do not overlap to any great extent as an excess of material will form a narrow ridge in the centre. On the other hand there should not be a strip of the surface which has not received the proper amount of material. A method which has been used with success to avoid these two objectionable conditions consists of laying a strip of heavy building paper at the edge of the first application and overlapping with the second application. The paper is then removed and destroyed.

The amount of material which should be applied will be in proportion to the thickness of the surface. For a compacted surface 3 in. thick the amount of bituminous material required to fill the voids is approximately 1½ imperial gal. per sq. yd. of surface. When the surface course is greater than 3 in. in thickness the amount of binder should be increased in proportion.

This should be followed by a thin layer of clean, crushed stone, all of which passes a 1½-in. circular opening and is retained by a ¾-in. or ⅝-in. circular opening. It should be spread uniformly and rolled with a 10-ton roller until it is thoroughly compacted, fills the voids in the larger stone, and the surface is even and true to grade and crown.

In some instances a seal coat of material, at the rate of ¼ to ½ gal. (imperial) per sq. yd., is used, being applied after the small stone has been rolled and all the loose material swept off the surface. The use of a seal coat is, however, not universal, and the question of its application should be decided by the engineer or superintendent.

Car Service Commission Hears Protests of Road Builders

At a meeting of men interested in road building, held at the Automobile Club of America on June 8, 1917, and noted in "Good Roads" for June 16, a resolution was adopted providing for a committee to take action looking to carrying into effect other resolutions adopted at the meeting, especially that part thereof referring to the shipment of road materials.

The chairman was given power to name the committee and to add thereto, and after several attempts to arrange for a conference between the committee and the Commission on Car Service of the railroads' organization for the war, such committee members as could be assembled, with Col. E. A. Stevens as acting chairman, met the commission at Washington on July 24. There were present on behalf of the committee Col. E. A. Stevens, member of the New Jersey State Highway Commission; Geo. P. Coleman, State Highway Commissioner of Virginia; H. G. Shirley, Chief Engineer of the Maryland State Roads Commission; M. B. Greenough, Chief Engineer of the National Paving Brick Manufacturers' Association, and E. L. Powers, Editor, "Good Roads." The following statement relative to the results of the hearing was issued by Messrs. Stevens, Shirley, Coleman and Powers, representing the committe, on Tuesday of this week:

"It was at once apparent that there was no desire on the part of the Car Service Commission to place any embargo on road materials, but rather a willingness to expedite shipments as far as possible. After a full discussion of the best means of meeting the problem it was the unanimous conclusion that this end could best be reached by furnishing the commission with such evidence as would aid the latter body in securing the maximum efficiency in the use of cars, each case of delay being dealt with on its own merits. In order to give this aid it is necessary that the commission be informed of cases where cars now returned empty could be used, of the dates, places and car numbers and initials of delayed shipments, of the causes of delay, and of any remedies suggested to secure improved service. In making such suggestions it must be remembered that there is a great shortage in freight cars needed for the transportation of freight for military purposes and for the necessities of the population. Any early increase in efficiency of transport of road materials can be attained only by a more efficient use of the present equipment and not by any addition to the number of cars.

"The committee believes that accurate and detailed reports of instances of failure to utilize present equipment to the best effect will be of material help to the Commission on Car Service and will be welcomed by them. The committee would, however, deprecate complaints unaccompanied by such facts and suggestions as will be of help in meeting the difficulties of the situation. The fitness and ability of the members of the commission are so well known and their unselfish interest in the work intrusted to them is so evident that the committee has full confidence that the inconvenience to road building interests will be reduced to a minimum as soon as the facts on which the necessary action must be based are laid before the commission."

Abolishing the Toll Gate in Pennsylvania

The problem of freeing all highways in the State of Pennsylvania is now occupying the attention of the public, and its solution is being arrived at as rapidly as possible. The work began in 1909 with the appointment of a Toll Road Commission to investigate the toll road proposition. This commission reported to the 1911 Legislature that it found 722 mi. of such roads in the commonwealth and recommended that this mileage be made free. In the six years that have intervened, 197.07 mi. have been freed by the state and local authorities. Within the next few weeks 41.5 additional miles will be freed by the State Highway Department.

Under the provisions of the Sproul Act of May 31, 1911, the department is authorized to purchase or to condemn toll

STATEMENT OF TOLL ROADS PURCHASED BY THE PENNSYLVANIA STATE HIGHWAY DEPARTMENT, JUNE 1, 1913, TO JULY 16, 1917.

Date of Purchase	Name of Turnpike	County	Length Miles		Amounts Paid	Total Cost
Apr. 2, 1914	Chambersburg and Bedford	Fulton	18.6			
	Award of Viewers				$16,650.00	
	Interest				216.22	
	Costs				254.96	$17,121.18
Oct. 26, 1914	Chambersburg	Adams	5.0			
	Award of Viewers				9,567.50	
	Interest				95.67	
	Costs				227.72	9,890.89
Oct. 21, 1914	Gettysbury and Petersburg	Adams	22.5			
	Award of Viewers				22,660.00	
	Interest				226.60	
	Costs				159.63	23,046.23
Nov. 7, 1914	Chambersburg	Franklin	10.5			
	Award of Viewers				27,213.65	
	Interest				272.14	
	Costs				253.08	27,738.87
	Expense acquiring above and one piece in litigation					3,683.38
Apr. 23, 1915	Chambersburg and Bedford	Franklin	18.0			
	Judgment entered				40,033.00	
	Interest				829.08	
	Costs				290.15	41,152.23
Oct. 2, 1915	Harrisburg, Carlisle and Chambersburg	Franklin	10.1		25,000.00	25,000.00
Jan. 6, 1916	West Kishacoquillas Valley	Mifflin	5.0			
	Purchase price			$9,500.00		
	Less local funds			800.00	8,700..00	
	Legal expense				3.25	8,703.25
Apr. 12, 1916	Somerset & Johnstown Plank Road (Davidsville and Bens Creek Sec.)	Somerset	5.7			
	Purchase price				7,500.00	
	Title examination				93.63	7,593.63
May, 1916	Center and Kishacoquillas	Center	7.0			
	Purchase price			$17,615.00		
	Less amount paid by county			4,403.75	13,211.25	13,211.25
Sept., 1916	(Voucher No. 10075—Professional services)				110.00	110.00
April, May and June, 1916	Lancaster Avenue Route 142, corps expense	Chester			378.77	378.77
Sept. 5, 1916	Northern Boulevard	Lackawanna	1.4	$90,000.00		
	Less amount paid by county			45,000.00		45,000.00
Sept. 5, 1916	Roaring Brook	Lackawanna	2.9		5,250.00	5,250.00
Oct. 13, 1916	(Title Guaranty & Surety Co., Scranton, title examination and recording fees)				361.00	361.00
Oct. 23, 1916	Bens Creek and North Fork Road	Somerset	2.5		4,800.00	
	Costs				200.00	5,000.00
Mar. 21, 1917	Wrightstown and Newtown	Bucks	6.1		8,200.00	8,200.00
Mar. 31, 1917	Centerville and Pineville	Bucks	3.7		5,600.00	5,600.00
Apr. 4, 1917	(Bucks County Trust Co., title insurance)					81.75
May 2, 1917	Lahaska and New Hope	Bucks	5.0			
	Purchase price			$15,000.00		
	Less amount paid by county			2,500.00	12,500.00	12,500.00
May 2, 1917	Buckingham and Doylestown	Bucks	5.0			
	Purchase price			$17,500.00		
	Less amount paid by county			2,500.00	15,000.00	15,000.00
July 16, 1917	Lancaster Avenue	Chester Delaware Montgomery	14.0			165,000.00

roads which are located on state highway routes, and the work has progressed just as rapidly as funds have been made available for the purpose. Specific appropriations for the acquisition of toll roads have been made as follows:

1913	$100,000
1915	250,000
1915 (deficiency)	24,000
1917	500,000

The accompanying table gives the names of turnpikes acquired by the Department from June 1, 1913, to July 16, 1917, with the costs of such acquisition:

The total mileage of toll roads in Pennsylvania on Aug. 1 was 524.93; of this mileage, 394.58 are located on state highway routes. The State Highway Department has no authority to take over toll roads which are not located on state highway routes. Where otherwise located, the commissioners of the county in which such roads are located may proceed by purchase or condemnation to take them over; or, any body of citizens desiring their abolition, may institute proceedings for the condemnation of the road, in which case, the county pays the price which may be fixed.

Below is the mileage of toll roads located on state highway routes, according to counties:

County	Miles	County	Miles
Adams	10.10	Indiana	1.96
Berks	41.73	Lancaster	81.00
Blair	4.00	Lebanon	23.79
Bucks	40.12	Lehigh	4.26
Cambria	3.64	Luzerne	.52
Dauphin	4.99	Mifflin	5.50
Delaware	14.50	Montgomery	71.58
Franklin	32.00	Westmoreland	6.50
Fulton	3.00	York	45.46
Total			394.58

The toll roads which are not located on state highway routes are as follows:

County	Miles	County	Miles
Adams	3.00	Huntington	4.00
Berks	9.00	Lackawanna	7.00
Bucks	17.75	Lancaster	70.63
Center	5.50	York	6.34
Franklin	7.13		
Total			130.35

The 1917 Legislature passed an act which authorizes counties, townships, boroughs, or incorporated towns, in which toll roads are located on state highway routes, to contribute such portion of the purchase price, or of the cost of condemnation proceedings, as may be agreed upon with the State Highway Commissioner.

All of the counties on which toll roads are located on state highway routes have agreed to cooperate on a 50% basis in freeing the county of toll roads.

Berks, Lebanon and Dauphin Counties each will pay its proportionate share, based on the mileage of turnpike in each county, of the cost of the Berks-Dauphin Turnpike which will be taken over by the State Highway Department about Sept. 1 at a cost of $70,000. [See "Freeing Turnpikes in Pennsylvania," "Good Roads," June 30, p. 385.]

Lancaster County is now conducting an aggressive campaign in an effort to abolish toll roads, the citizens having not only agreed to meet the department halfway in freeing toll roads on state highway routes, but they are also making an effort toward the freeing of other roads as well.

Proceedings are under way in the courts of Delaware County for the condemnation of the Philadelphia and West Chester Turnpike, which is 8.5 mi. in length.

In Mifflin County proceedings have been instituted for the condemnation of the Lewistown and Kishacoquillas Turnpike which is 5.5 mi. long.

Westmoreland County has agreed to pay one-half of the cost of freeing the Deongal-Mount Pleasant Township Turnpike and negotiations are nearing completion for its purchase at a cost of $10,000. With the passing of toll; on this turnpike all highways in Pennsylvania, west of the Allegheny Mountains, will be free for public travel.

There is no doubt but that a few years, if adequate appropriations are made available for this purpose, will see the last of toll roads in Pennsylvania.

Two Million Dollars in Road Contracts to be Let in Ohio

State Highway Commissioner Cowen, of Ohio, will let contracts for the construction of 109.28 mi. of highways on Aug. 15 and 16. The proposed work is in various parts of the state, the roads to be improved being located in 45 counties.

Full information on this letting is given in the "Contract News" section of this issue.

Good Roads Field Day in Michigan

The West Michigan Pike Association and other road organizations will hold a "Good Roads Field Day" at Cass City, Mich., on Aug. 24.

The occasion will be marked by the unveiling of a monument in honor of Horatio S. Earle, Michigan's first state highway commissioner and an ardent worker in the cause of good roads. The monument, which will be erected near Cass City on the first state aid road built in the state, is a rough granite block about five feet high, bearing a copper plate with the inscription "In Honor of Horatio S. Earle, First State Highway Commissioner of Michigan, 1905-1907."

Prison Labor in a Kansas County

An example of the manner in which the new prison labor law is being carried out in Kansas is given in a communication addressed to the governor of the state by the sheriff of Butler County, as follows:

"We work from 8 to 12 prisoners and have been doing this for about three weeks. We have a wagon and team to haul the men out to the places that need repairing most, such as rocky hills and bad ditches. One guard in addition to the driver of the wagon handles them. Most of the men are willing to work, and they give perfect satisfaction.

"We had three colored men and one Mexican who refused to work, but bread and water and kind talk and treatment got them going. Some of our old offenders are not so anxious to get in jail now as formerly. I am well pleased with the new law and believe it to be a success from every angle."

NEWS NOTES

Twenty-Eight Counties in North Dakota have asked for federal aid for road construction. Surveys of federal aid projects are being made in six of the counties.

The Sage Foundation Report on "City and County Government in Springfield, Ill.," says that notwithstanding the differences in taxable property valuation, the farmers have better roads than the city dwellers.

A Special Road for Motor Trucks is under construction in California. It runs from Los Angeles to the harbor at San Pedro, a distance of 13 mi., and has a width of 40 ft. The road foundation is of water bound macadam upon which is placed solid concrete to a depth of 8 in., with a bituminous top surface. It is estimated that the road will cost $365,106.

The New State Highway Between Canon City and Cripple Creek, Colo., will probably be ready for travel by Oct. 1, according to the opinion of those in charge of the work of building the road. With the exception of about 1 mi. the road is completed in Teller County; the work in Fremont County is being carried forward as rapidly as possible. The highway is being built on the abandoned roadbed of the Florence & Cripple Creek Railway, the bridges en route being utilized, with slight repairs, with the exception of two that were destroyed by a flood.

MEETINGS

Calendar of Coming Meetings

August 15-17.—League of Wisconsin Municipalities.—Annual convention, Racine, Wis. Secretary, Ford W. MacGregor, Madison, Wis.

August 22.—Union of New Brunswick Municipalities.—Annual convention, St. John, N. B. Secretary, James King Kelley, St. John, N. B.

August 27-29.—Union of Canadian Municipalities.—Annual convention, London, Ont. Secretary, W. D. Lighthall, K.C., Westmount, P. Q.

Aug. 29-31.—Ontario Municipal Association.—Annual convention, Toronto, Ont. Secretary, B. H. Spence, 705 Lumsden Building, Toronto, Ont.

Sept. 5-8.—League of American Municipalities.—Annual convention, Gary, Ind. Secretary, Robert E. Lee, City Hall, Baltimore, Md.

Sept. 11-13.—American Association of Park Superintendents.—Annual convention, St. Louis, Mo. Secretary, Roland W. Cotterill, 533 City Hall, Seattle, Wash

Sept 18-20.—League of Virginia Municipalities.—Annual convention, Lynchburg, Va. Secretary, L. C. Brinson, Portsmouth, Va.

Sept. 24-29.—League of California Municipalities.—Annual convention, Santa Rosa, Cal. Secretary, Wm. J. Locke, Pacific Building, San Francisco, Cal.

Oct. 17-18.—League of Minnesota Municipalities.—Fifth annual convention, St. Cloud, Minn. Secretary-Treasurer, Richard R. Price, University of Minnesota, Minneapolis.

Nov. 19-24.—City Managers' Association.—Annual meeting, Detroit, Mich. Secretary, W. L. Miller, City Manager, St. Augustine, Fla.

Nov. 21-24.—National Municipal League.—Twenty-third annual meeting, Hotel Statler, Detroit, Mich. Secretary, Clinton R. Woodruff, 703 North American Building, Philadelphia, Pa.

Burlington Way Good Roads Association

The sixth annual convention of the Burlington Way Good Roads Association will be held at Springfield, Ill., on Monday, Aug. 13, at which time the question of new routes and the changing of present ones will be discussed. The election of officers for the ensuing year will take place.

Meridian Road Association

At a recent meeting of the Meridian Road Association at Salina, Kan., a resolution was adopted urging the construction of at least five miles of improved road in each county traversed by the Meridian Road, within the next year, and that the matter be taken up with the different county commissioners. All of the counties affected were represented.

At a convention held in Salt Lake City, Utah, on July 21, the Utah Better Roads Association was organized. The chief topic of discussion at the convention was the highways of Utah. The meeting was largely attended by state and county road officials and good roads advocates.

The Arkansas National Highway Association was organized at the good roads meeting held at Eureka Springs, on July 26, for the purpose of securing the routing of national highways through the state. Officers were elected as follows: President, Joe W. House, Jr., of Little Rock; Vice President, E. P. Toney, of Lake Village; Secretary, C. C. Calvert, of Fort Smith.

The League of Wisconsin Municipalities will hold its nineteenth annual convention at Racine on Wednesday, Thursday and Friday of next week. It is expected that a large number of the cities of the state will be represented at the meeting. The officers of the league are Major C. B. Clarke, of Neenah, President; Major H. W. Adams, of Beloit, Vice President; Prof. Ford W. MacGregor, of the University of Wisconsin, Secretary-Treasurer.

PERSONAL NOTES

L. D. Smoot has resigned as Commissioner of Public Works of Jacksonville, Fla.

E. W. M. James has been appointed Bridge Engineer of the Good Roads Department of Manitoba, Canada.

John E. Ballinger has resigned as head of the highway department, Board of Public Works, Jacksonville, Fla.

A. I. McCullough, of Cambridge, Ohio, has been elected Chairman of the State Highway Advisory Commission.

C. E. Henderson, who was appointed City Engineer of St. Augustine, Fla., in 1915, has been made County Engineer of St. Johns County.

Julian Montgomery, Sanitary Engineer of Austin, Texas, has been appointed Chief Office Engineer of the Texas State Highway Commission.

Frank A. Farley has been appointed Construction Engineer of the Department of Public Works of Ohio. He was formerly Assistant Engineer of Cincinnati.

Wesley Pease has resigned as Assistant Engineer of Dayton, Ohio, and will take charge of engineering work in connection with the cantonment at Chillicothe, Ohio.

Nathan Schein, Assistant Engineer in the Department of Streets, Pittsburgh, Pa., is now engaged on construction work in connection with the government cantonment at Annapolis Junction, Md.

William F. Moore, former City Engineer of South Bend, Ind., and City Engineer of Grand Rapids, Mich., for the past two and a half years, has been appointed State Highway Engineer of Indiana.

R. M. Bowman has been appointed Highway Bridge Engineer of the U. S. Office of Public Roads and Rural Engineering. Mr. Bowman has been engaged in railroad work as Assistant Engineer of the Lake Erie & Western Railroad. He will be located at Washington, D. C.

W. H. Waugh has been appointed Senior Highway Engineer of the U. S. Office of Public Roads and Rural Engineering at Juneau, Alaska. He formerly had charge of highway work in the Philippine Islands as Division Engineer of the Department of Public Works at Manila, P. I.

A. T. Hansen, Chief Deputy City Engineer of Los Angeles, Cal., since 1913, has been made City Engineer to succeed Homer Hamlin. Mr. Hansen was formerly with the United States Reclamation Service, and later, as Assistant Engineer of Los Angeles, directed construction work on the Los Angeles Aqueduct and other important structures.

GOOD ROADS

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The Distribution of Pressures Through Earth Fills

In the paper of the above title presented by A. T. Goldbeck, Testing Engineer, Office of Public Roads and Rural Engineering, U. S. Department of Agriculture, at the 20th annual meeting of the American Society for Testing Materials at Atlantic City, N. J., in June of this year, is a detailed description of a series of experiments made to secure data on the distribution through earth fills of the vertical pressures exerted by concentrated loads.

The instrument used in determining the pressures consists of a small cell which is buried under the fill to be tested. Air introduced into the cell under known pressure acts against a diaphragm which is also acted upon from the outside by the pressure of the fill above it. The air pressure is increased until it just equals the pressure of the soil, when an electrical contact is broken and a small electric light at the indicating apparatus is extinguished. The cell can, of course, be placed at any distance from the recording apparatus and successive determinations can be made with the same cell.

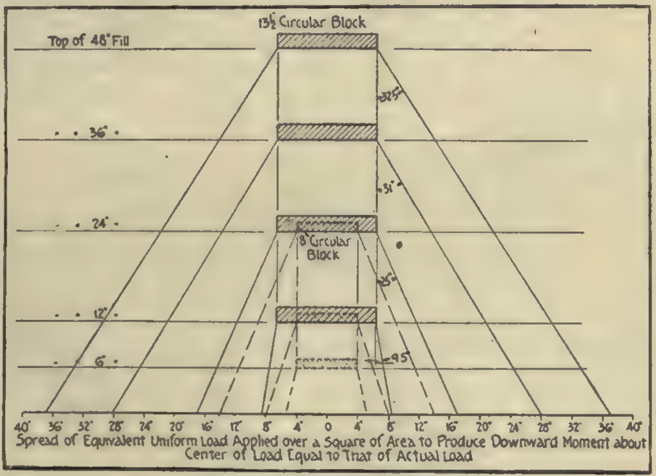


FIG. 1—SEE PAGE 81.

In the investigation made by Mr. Goldbeck several cells were placed at the bottom of a bin situated in a special building, with very heavy reinforced concrete floor, built by the Office of Public Roads and Rural Engineering at the Department of Agriculture's Arlington Experimental Farm. A bin 7½ ft. square was used for all fills up to 2 ft. in depth and for fills over 2 ft. the length of the bin was increased to 14 ft. The soil pressure measuring cells were placed along a straight line in the floor of the bin, distances between cells, from the central cell outward on each side, being 5½, 5½, 7, 18, 18 and 18 in. One cell was also placed on each side of this line of cells, 10 in. distant from the central cell and at right angles to the line. The cells were placed with their top surfaces flush with the concrete floor and the air pipes from the cells to the recording apparatus were led down to the floor below that carrying the bin.

The material used for the fills consisted of a coarse concrete sand dredged from the Potomac River. The mechanical analysis of the material was as follows:

Passing Sieve No.	and Retained on Sieve No.	Percentage
¼-in.	10	11.0
10	20	18.0
20	30	25.4
30	40	16.4
40	50	9.0
50	80	12.0
80	100	3.2
100	200	3.4
200	...	1.6

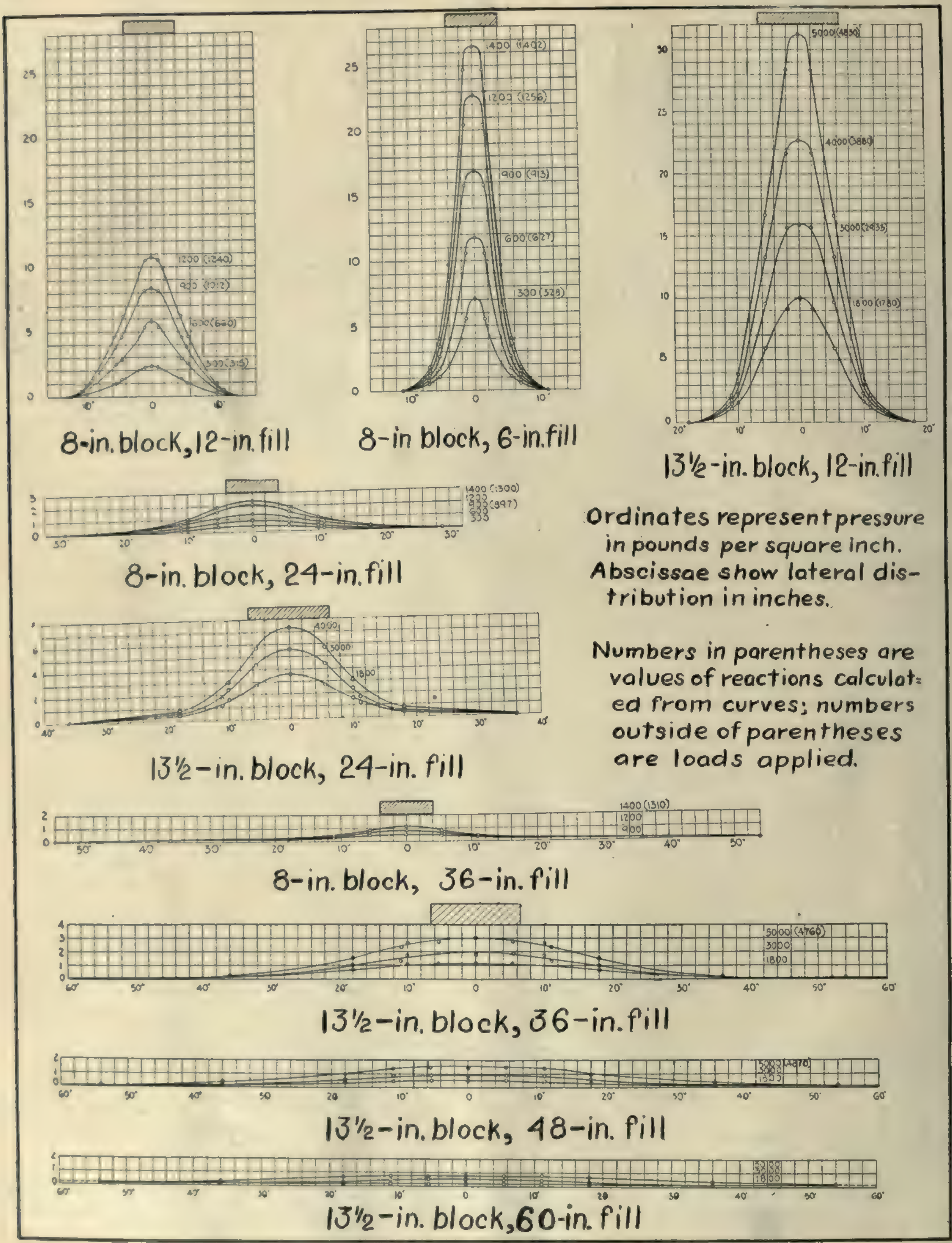
The sand was tested moist, as delivered, and was kept moist by sprinkling, the moisture content being kept at from 3 to 5%. The sand was deposited in the bins in 3-in. layers, each compacted with heavy wooden tampers.

When the proper depth of fill had been obtained, the surface of the sand was smoothed off and a bearing block centered over the measuring cells. Two circular bearing blocks were used, one 8 in. in diameter and the other 13½ in. in diameter. The load was applied by means of a 100-lb. weight moved back and forth along an I-beam, one end of which rested upon the bearing block. The beam was provided with knife edges and was kept level during the experiment. It was also necessary to exercise special care in placing the bearing block and in keeping it level, as even a slight deviation from its position over the central cell, or from the horizontal, would affect the readings of the cells near the center.

After the proper depth of fill had been made, readings were taken to show the pressure exerted by the sand alone. The bearing block was then adjusted and the required loads applied, readings being taken on each cell after each application. In some instances the process was varied by taking the greatest load first and making the final reading from the weight of the sand alone. "Under low fills," according to Mr. Goldbeck, "it was found that the curve of readings changed very rapidly only a few inches from the center, and in order to obtain the correct shape of the curve it was found necessary to offset the position of the bearing block 1 in. or 2 in., thus permitting of taking readings close to the center cell. In this way readings 1 in. off center could be obtained and the shape of the pressure curve very accurately determined."

The results of the tests, which are shown in the accompanying figures, were discussed by Mr. Goldbeck as follows:

"The readings due to the weight of the sand alone were subtracted from the readings obtained when the fill was loaded. The differences were plotted as ordinates. The abscissas represent the lateral distribution of the pressures. Since a circular bearing block was used, it is to be assumed that the pressures in all lines passing through the center are identical with those measured. The volume of the solid generated by rotating a curve of pressure about its vertical axis when multiplied by the number of pounds represented by a cubic inch will equal the reaction. These reactions



8-in. block, 12-in. fill

8-in block, 6-in. fill

13½-in. block, 12-in. fill

8-in. block, 24-in. fill

13½-in. block, 24-in. fill

8-in. block, 36-in. fill

13½-in. block, 36-in. fill

13½-in. block, 48-in. fill

13½-in. block, 60-in. fill

Ordinates represent pressure in pounds per square inch. Abscissae show lateral distribution in inches.

Numbers in parentheses are values of reactions calculated from curves; numbers outside of parentheses are loads applied.

FIG. 2.—PRESSURE DISTRIBUTION THROUGH DAMP SAND FILLS.

have been calculated for a number of the applied loads, and are shown in parentheses on the curves. The loads applied are shown outside the parentheses; theoretically they should be identical, and actually they are nearly equal. When it is remembered that any slight difference in the compaction of the sand in the different radial planes will change the intensity of the pressure exerted in those planes, and when it is remembered that the pressures were measured principally in a single plane and partly in a plane at right angles, the agreement of the calculated reactions with the applied loads is remarkably close. The reliability of the apparatus for measuring pressures through sand is thus established.

"The designing engineer is continually encountering the design of structures subjected to the pressure of earth fills or to pressures transmitted through fills. The present tests were made under conditions which resemble those in a road slab having an earth covering. In the design of such a slab, the engineer is primarily interested in the amount of distribution of a concerntrated load furnished by the earth fill. He would like to know the lateral distribution in order that he may figure what width of slab carries the load. He would like to know the distribution forward or backward from the wheel load in order that he may determine the moment about the concentrated load of the distributed pressure load, and thence obtain the bending moment.

"It is a very common practice at the present time to assume that a wheel load acts over a definite area on top of the fill, that the pressure is transmitted with uniform intensity to the slab, and that it acts over an area determined by an assumed angle of spread from the top of the fill. This assumption of uniform intensity is of course wrong as shown by these pressure measurements, but forms a convenient means of calculation provided the correct intensity and area of pressure are assumed. In order to make use of the curves of pressure for practical calculations of bending moment, it would be well to know the location of the center of gravity of the half volume of the figure generated by revolving the curve about its central axis. The distance from the center of gravity to the center of the curve, multiplied by one-half of the total load, is the moment about the wheel load of the distributed pressure to either side of that load. The centers of gravity of these half volumes for the maximum loads applied to the various depths of fill have been calculated, and are shown in Table I.

TABLE I.—LOCATION OF CENTER OF GRAVITY OF HALF OF PRESSURE ON SLAB WITH RESPECT TO CENTER OF LOAD.

Depth of Fill, in.	8-in. Block Load, lb.	8-in. Block Center of Gravity to Center of Load, in.	13½-in. Block Load, lb.	13½-in. Block Center of Gravity to Center of Load, in.
6	1,400	2.6	....	..
12	1,200	3.6	1,800	4.4
			5,000	4.2
24	1,400	7.0	1,800	10.5
			4,000	8.4
36	1,400	16.8	1,800	16.0
			5,000	14.0
48	....	..	5,000	18.5

TABLE II.—EQUIVALENT SQUARES OF AREA.

Depth of Fill, in.	Load on 8-in. Block, lb.	Length of Side of Square of Uniform Pressure Area, in. 8-in. Block.	Length of Side of Square of Uniform Pressure Area, in. 13½-in. Block.	Load on 13½-in. Block, lb.
6	1,400	10.4	...	....
12	1,200	14.4	17.6	1,800
			16.8	5,000
24	1,400	28.0	42.0	1,800
			38.6	4,000
36	1,400	67.2	64.0	1,800
			56.0	5,000
48	....	...	74.0	5,000
60	....	...	...	....

"If, for the convenience of the designer, the pressure at the bottom of the fill is considered uniform and acts over a square of area, the sides of each of these areas will be equal to the values in the last column of the preceding table multiplied by four. The sides of the squares of areas thus obtained are somewhat different for the highest and lowest loads applied and may be tabulated as in Table II.

"The results in Table II, for the high loads only, are shown graphically in Fig. 1. In calculating the bending moment in a slab the designer, instead of using the varying intensity of the load, as it is shown to exist in the pressure measurements, may consider the same total pressure applied over a square of area whose side is given in Table II or as shown in Fig. 1.

"It is realized that in order to give complete data on this problem, so that it will be entirely useful to the designing engineer, several other kinds of filling material should be investigated, and bearing blocks shaped and spaced like wheels and rollers should be applied to the fill. This will all be undertaken in the investigation still under way, as well as the question produced by vertical loads."

Methods of Road Maintenance in Montgomery County, Alabama*

By THOMAS EDWARDS†

The area of Montgomery County is 800 sq. mi. There are 700 mi. of public roads in the county, of which 450 mi. are improved gravel roads. The 450 mi. of improved roads represent a minimum value, as fixed by the United States Government, of $5,000 per mi., or a total of $2,250,000, exclusive of bridges.

The total bonded debt for our splendid system of roads is only $825,000, or approximately 30% of the total value of the roads. The last issue was in 1909. An interesting fact here is that, since the last issue of bonds for road work, the county has not only maintained all the roads built from the proceeds of the bonds, but has, in addition, out of the annual income, by judicious and economical administration, built more mileage than was originally constructed by the proceeds of bonds. In addition, the county's bridges have been built and paid for. There are more bridges in Montgomery County than in any other county in the state, on account of the number of creeks and streams and the peculiar contour of the land. This item alone is a most expensive one, both for construction and maintenance. The plan is to finally eliminate every wooden bridge and substitute concrete bridges.

The greatest problem confronting the county officials is the maintenance of this great mileage of roads, and I shall confine my remarks principally to the methods by which we are attempting to carry out this work. To do this in the most systematic and economical manner, it has been found necessary to divide the county into districts, comprising about 30 to 40 mi. of road. In each district is located a competent road foreman, whose duty it is to keep the roads of his district in proper shape. He is furnished with mules, wagons and all necessary road machinery and such competent labor as is absolutely necessary, depending upon what is known as "free labor," or what is termed in law as "statute labor." This free labor means that all male persons residing in the county between the ages of 18 and 45 years, who are not physically disabled, are subject to road duty for 10 days during each year, or, in lieu of such work, a rate of 50 ct. per day may be paid.

Each district overseer at the beginning of each year takes a complete census of this labor in his district, and from time to time when he needs extra labor these men are called upon to serve, thus saving many thousands of dollars a year in paid labor. At the same time judgment is exercised in warning or summoning this labor, to see that no undue hardship is imposed on the farmers in taking away from them their labor at times which would seriously interfere with the working of the crops.

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*From an address before the Rotary Club, at Montgomery, Ala., July 18, 1917.

†County Highway Engineer of Montgomery County, Alabama.

The law as fixed to cover this road work is stringent; refusal on the part of a person summoned to work the road subjects him to penalty or imprisonment through court process.

In addition to the district foreman named above, there are two bridge outfits, one for the repair and building of wooden bridges, the other a concrete outfit, with pile-driver and equipment for constructing piers, and concrete mixers for the building of all types of concrete bridges.

There is also a fleet of seven of the latest improved White road trucks with full complement of trailers and road machinery for hauling, scraping and scarifying. The trucks are used as floaters—that is, they are not confined to any district, but are placed where most needed. Each truck replaces about 24 mules, and has proved most economical. The cost of gravel hauled by this method has been reduced from approximately 40 ct. per yd. per mi. to an average of about 12 ct. per yd. per mi., in some cases running as low as 9 ct. These trucks can travel on an average of 60 mi. a day in the usual run of their work. With a scarifier or road ripper attached to one of these trucks we have made practically new roads from those which apparently have been worn out, at a cost as low as $15 a mi. without the addition of a single yard of new material. It has cost some counties in this state as high as $400 per mi. for the same class of work.

The county owns its gravel pits, with steam equipment for loading, and its supply is practically unlimited. Only recently the county has added to its gravel supply approximately 85 acres of excellent gravel lands, the deposits on which are sufficient to insure the future maintenance of the county for 50 or 60 years. There have been deposited on the main trunk roads of the county over 8,000 cu. yd. of gravel for future use. This gravel represents an outlay of over $200,000, and has proved, and is proving, a most economical outlay.

Investigation is now being made of plans which contemplate the surfacing of the roads with an oil preparation or an asphaltum treatment, which will serve two good purposes: first, the preservation of the roads, reducing maintenance, and, second, the elimination of dust.

Connecticut Motor Law

The Commissioner of Motor Vehicles, whose offices are located in the State House at Hartford, has charge of the registration of motor vehicles in Connecticut and the issuing of licenses therefor. The 1917 Legislature revised the motor vehicle law in some respects, but its main provisions which are similar to those in general use in other states, remain unchanged.

The annual registration fee for a motor vehicle, exclusive of commercial vehicles and motorcycles, is 50 ct. per horse power, based on the A. L. A. M. formula in the case of internal combustion engines, and in the case of steam and electric cars, on the horse power as stated by the manufacturer. After the last day of March in any year a pro rata reduction is allowed in registration fees, which are chargeable from the first day of the month in each case.

The annual registration fees for commercial vehicles are calculated on a graduated scale by tons and half tons, varying from $11 for a car weighing 1,000 lbs., to $200 for one weighing 8 tons, and for each additional ton or fraction of a ton, $100 is charged, the only change in the schedule of rates being an advance from $175 to $200 for the 8-ton vehicle. Motorcycles are taxed $2 each.

Section 4 relating to dealers, manufacturers and repairers has been revised. Every motor vehicle owned by, or temporarily in the custody of a dealer, manufacturer or repairer is regarded as registered under the general distinguishing number or mark of such dealer, manufacturer or repairer "until sold or let for hire or loaned to a purchaser of a motor vehicle for one period of not more than 5 successive days from the date of such purchase."

A dealer representing any particular manufacturer is required to file with the commissioner a certificate to that effect.

Subdivision C of Section 4 provides that: "No manufacturer, dealer or repairer shall use any motor vehicle registered under the preceding provisions of this section for any other purpose than the trial and adjustment of such motor vehicle or for its demonstration to a prospective buyer or for some purpose incidental to the legitimate business or personal use of such manufacturer, dealer or repairer, but in no case shall a motor vehicle registered under the provisions of this section be rented for hire, or used for the purpose of conveying passengers or freight for hire."

A dealer or sub-dealer who has filed his certificate of appointment as provided "may make application for a special distinguishing number or mark for use only when transporting new motor vehicles over the public highways from the place of delivery of said vehicles to him by the manufacturer thereof to any place of business of such applicant, but not for demonstration, testing or any other use. The commissioner may, if satisfied as to such facts as he may require in such application, issue to the applicant a special certificate of registration containing the name, residence and all of the registered business addresses of the applicant where he conducts the sale of motor vehicles, and also the special distinguishing number or mark assigned to such applicant for such special use, and such other information as said commissioner may determine, and every new motor vehicle transported by the applicant from its point of delivery direct to any of his business places shall be regarded as registered under and having assigned to it such special distinguishing number or mark."

A "public service motor vehicle" requires two registrations —one as a privately owned car, and the other, a special registration according to class. Such vehicles include "any motor vehicle operated as a jitney and any motor vehicle used for the purpose of soliciting and receiving passengers upon any public highway and carrying such passengers upon the payment of an individual fare, but not including omnibuses running regularly between railway stations or boat landings and hotels."

The Commissioner of Motor Vehicles is required to furnish one set of number plates, annually, without charge, for each registered motor vehicle, one set of special number plates for each public service motor vehicle, and twelve sets of plates for "each general register number of each registered manufacturer, dealer or repairer." Upon the receipt of $2 per set, he may furnish "not to exceed twenty-five pairs for each special register number for each specially registered dealer." But these special number plates may not be used for any other purpose except for transporting a vehicle from its place of delivery direct to any of the business places of the dealer.

To secure a license to operate a motor vehicle in Connecticut an applicant must be over 18 years old and, in the opinion of the commissioner, "a proper person to receive it," and must demonstrate that he has "sufficient practical knowledge of such portions of the mechanism of motor vehicles as have to do with their safe operation, and a knowledge of the rules of the road."

In addition to an operator's license, the operator of a public service motor vehicle is required to secure a special license which will not be issued except upon a certificate of the chief of police or other municipal authority of the place of residence of the applicant.

The provisions governing the use of equipment and lights were not changed except with regard to the latter. The law reads as follows:

> Every motor vehicle, except a motorcycle, shall, when in operation, during the period from one-half hour after sunset to one-half hour before sunrise, and whenever fog renders it impossible to see a long distance, display at least two lights on the forward part of such vehicle, and every motorcycle so operated shall display at least one light, which light or lights shall in clear weather be visible not less than 200 ft. in the direction in which such vehicle is proceeding. Every motor vehicle so operated shall display a red light from behind, and a white light shall be so arranged as to illuminate the rear number plate. * * *
>
> Whenever there is not sufficient light, within the limits of the traveled portion of the highway, to make all vehicles, persons or substantial objects clearly visible within a distance of at least 150 ft., the forward lights which a motor vehicle is required to display shall, when the vehicle is in motion, throw sufficient light ahead to show any person, vehicle or substantial object upon the roadway straight ahead of the motor vehicle for a distance of at least 150 ft.
>
> Any light thrown directly ahead or sidewise shall be so arranged that no dazzling rays or beams of reflected light, from it or from any reflector, shall, at any time, be more than 3½ ft. above the ground on a level road at a distance of 75 ft. ahead of such vehicle, and such lights shall be sufficient to enable the operator of the motor vehicle to see any person, vehicle or substantial object upon the roadway or at the side of the road within 10 ft. on each side of the motor vehicle and 10 ft. ahead of such vehicle.
>
> No spot light shall be used when another approaching vehicle is in sight, except when projecting its rays directly on the ground at a distance not exceeding 30 ft. in front of the vehicle using spot light and to the right of the center of the highway. * * *
>
> Every motor vehicle, when standing upon a public highway during the period from one-half hour after sunset to one-half hour before sunrise, shall show at least one light in front, such light to be on the side nearest the center of the road, and shall display at least one red light in the rear. * * *
>
> The commissioner is authorized to pass upon any lighting or other device covered by any section of this act and upon the equipment of any car, and shall, for this purpose, have an examination made of all such devices submitted to him; and, if in his judgment, any such device, when properly applied to a motor vehicle licensed under the authority of this act, shall conform to the provisions hereof he shall issue a certificate to the manufacturer, owner or user of such device, as the case may be, that the same, when properly applied or adjusted, is in compliance with the provisions of this act.

All commercial motor vehicles not equipped with pneumatic tires that are so constructed or that are carrying loads which obstruct the view to the rear must carry mirrors or reflectors so adjusted as to provide the operator with such a view.

The law requires all commercial motor vehicles to be equipped with rubber tires, and that no part of the metal of the wheel or tire shall come in contact with the road surface. If the vehicle weighs over 2 tons its maximum carrying capacity in pounds must be shown on a plate or by other permanent marking in a conspicuous place near the driver's seat.

Connecticut exchanges the courtesy of the road for a period of one month with non-residents duly registered in their own states. But to operate a public service motor vehicle it is necessary to obtain the special license required for such vehicles. The equipment of the non-resident's car must conform to the requirements of the laws of Connecticut.

The speed of motor vehicles must be regulated with regard to "the width, traffic and use of the highway," and in a manner not "to endanger the property or the life or limb of any person." If the rate of speed exceeds 30 mi. an hour for a distance of ¼ mi., or 20 mi. an hour for such period in the "thickly settled portion of any town, city or borough where the buildings average less than 100 ft. apart," it is deemed prima facie evidence of a violation of the law. At highway intersections where the view is obstructed, or when crossing bridges over 25 ft. in length, or at sharp turns or curves, that have been signposted, except within the limits of a city, the rate of speed must not exceed 10 mi. an hour. The speed of a motor vehicle without pneumatic tires must not exceed 15 mi. an hour on any highway, or 8 mi. an hour on any bridge or intersecting highway.

The operation of a motor vehicle by an intoxicated person, or for a wager, in a race or for a speed record, is prohibited. An operator who knowingly has caused personal injury or damage to property, is required to stop and render necessary assistance, and upon request furnish complete information as to his name, address, license, and registration number. Such operator must report the accident, if personal injury to another resulted from it, or if the damage to property exceeded $10, within 24 hours to the Commissioner of Motor Vehicles.

A special permit is required to operate a commercial vehicle of a combined weight of vehicle and load exceeding 25,000 lbs.

The provisions relating to speed reduction and the right of way are as follows:

> Upon approaching an intersecting highway, a curve or a corner of a highway, or a schoolhouse, provided signs on the highway, legible from a distance of 100 ft., indicate such highway, curve, corner or schoolhouse, any person operating a motor vehicle shall reduce its speed and give a timely signal when reasonable care requires, and shall keep to the right of the intersection of the center of both highways when turning to the right, and pass to the right of the intersection of the center of such highways before turning to the left.
>
> Each driver of a motor vehicle approaching any intersecting street or highway shall grant the right of way at such intersection to any vehicle approaching from his right, provided where traffic officers are stationed they shall have power to regulate traffic.

Suitable signs, legible from a distance of 100 ft., are required to be placed and maintained by towns at a distance of approximately 500 ft. on each side of schoolhouses, bridges, dangerous curves and intersecting highways, provided such signs have not already been erected and are being maintained by the highway commissioner or other person.

A full stop of not less than 10 ft. from the rear of a street car which is discharging or receiving passengers must be made before proceeding at a "reasonable rate of speed."

Tire chains are permitted when the condition of the highway renders them necessary for safety.

A town, city or borough has no authority to pass ordinances respecting the speed, lighting or equipment of motor vehicles, aside from the authority given them to regulate traffic or parades, the use of public parks, traffic routes and public stands for public service vehicles.

A justice of the peace before whom a complaint may be brought has authority to render judgment when the fine or penalty does not exceed $100 or imprisonment for 10 days or both. An automobile may be offered for bail or part bail, according to its apparent value, in lieu of other bail.

Section 46 of the act, which is now in effect, provides that all money received from license fees and from fines imposed under it, shall be used by the State Highway Commissioner for the maintenance of state highways without specific appropriation from the general assembly, and in addition to amounts appropriated by the assembly for such purpose.

Road Building in North Carolina During the War[*]

By DR. JOSEPH HYDE PRATT[†]

I have been led to take up this subject from the fact that the entrance of the United States into the world war has caused several states to start to change their road policy; and questions are constantly coming up in regard to what changes should be made in county road work—whether or not all new road work should be stopped and the states and counties confine themselves to simply keeping up the roads already completed. Another question that is constantly being asked is: "What does the War Department desire the various state highway departments to do?" I wish to consider briefly this subject under five different heads, as follows:

1. What changes should be made in county road work? 2. What roads should be built? 3. Military roads. 4. Road construction back of the front. 5. Cooperation of state highway departments and the War Department.

At a meeting held in Washington some weeks ago, at which there was a conference of the executive committee of the American Association of State Highway Officials and the engineers of the War Department, it was decided that, as far as possible, the states should carry on their road work as under normal conditions, but that they should make an effort to construct continuous roads across the states, connecting county with county and connecting the roads of one state with those in another.

There never was a time when the road authorities of a county should give as serious consideration to the location and character of roads built as during this war period. Their decision in regard to what roads to build should not depend upon satisfying some particular persons or even some particular section and thus build a small section in one part of the county and another in another; but they should give special attention to the construction of roads that will lead from one center to another center across the county. Particular attention should be given to the construction of such roads as will permit easy communication from centers of production to centers of consumption of agricultural products. With the construction of such a system of inter-county roads, it will be possible for North Carolina, as well as other states, to transport a large tonnage of agricultural and manufactured products over her public roads. This will help to reduce the car shortage of our railroads and make it possible to bring to market other products that might otherwise be almost indefinitely delayed.

Such roads would also make interstate roads, which could be used in the transportation of army supplies and troops. The War Department requests that these main highways be constructed so that they will sustain trucks carrying a weight of 4,000 lb. on the front wheels and 6,000 to 8,000 lb. on the rear wheels.

The counties should take up the question of issuing bonds for road work, as in past years. I believe it will be found that county road bonds can be sold just as favorably at the present time as at any other. The road authorities, however, should keep in mind that there is to be a considerably increased amount of traffic over the roads, and they must be sure that they are providing a sufficient amount of revenue to maintain the roads after they are built.

Practically all these through roads across North Carolina will become military roads and, in fact, the federal aid road fund can be spent in the construction of military roads just as well as post roads. Several of these roads, which may become of considerable military importance, pass through Asheville. The Swannanoa Gap Road, leading from Asheville across the Blue Ridge to Old Fort, a link in the Central Highway, is a part of a road that should be of considerable military importance, as its connection through either Madison or Haywood Counties to the Tennessee line will facilitate connection with eastern Tennessee and the coal fields with Piedmont North Carolina and South Carolina. Ten thousand dollars of the federal aid road fund has been apportioned to the Swannonoa Gap Road, $8,000 to the link in Haywood County, and $9,500 to the link in Madison County. Provision has also been made for carrying the Haywood County highway across Swain County to the Tennessee line.

The Hickory Nut Gap Road is another federal aid road which will come under the head of an important military road. The state has allotted $10,000 of the federal aid road fund to assist in the construction of this road.

It is the hope that in eastern North Carolina as rapid progress can be made in building main highways back from the coast as is now being made in building roads from the west into the Piedmont section. Such highways that would be of military importance would be those from Wrightsville and Southport via Wilmington into the Piedmont section: also from Beaufort to Goldsboro following the route of the Central Highway; and from Norfolk across the northeastern counties into central North Carolina. On many of these roads allotments from the federal aid road fund have been made.

Under the head, "Road Construction Back of the Front," I would state that for the time being the Atlantic seaboard represents our front from the standpoint of the war. This is the part of this country that would probably be first attacked in case an enemy should attempt to invade the United States. Our state highway departments of the Atlantic Coast states are cooperating with the War Department in preparing information and statistics regarding supplies that can be used in road and railroad construction along the seaboard, and our state department has signified its willingness to construct any road that the War Department may decide is necessary for military purposes.

The state highway departments are also cooperating with the War Department in regard to available road machinery and supplies that may be made ready for federal service. In North Carolina we have but very little road machinery connected with the State Highway Department, but we have taken up with the various counties of the state the question of the availability of their road equipment and in nearly all cases the commissioners have agreed that such machinery as they had would be made available for federal service if desired.

I have tried to show that the amount of road work throughout North Carolina should be continued approximately as in normal times, but that more consideration should be given by our commissioners to the construction and maintenance of the inter-county highways, as such roads are of very great importance, not only for ourselves but for military purposes.

Pointe Coupee Parish, Louisiana, is to have a model highway 32 mi. in length, and a contract has been let for its construction by the State Highway Department. The estimated cost of the work is $180,000. The improved road will extend from New Roads, the county seat, back to New Roads, making the loop around False River, and traversing a beautiful section of the country.

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[*] Abstract of a paper on "Road Construction During the War Period," presented at the annual convention of the North Carolina Good Roads Association, Asheville, N. C., July 9-11, 1917.

[†] Secretary, North Carolina State Highway Commission; Secretary, North Carolina Good Roads Association.

Physical Tests for the Materials Used in Building Gravel and Sand-Clay Roads*

By ROY M. GREEN†

Modern methods of testing materials for highway construction have been developed during the past 40 years. Prior to that time reliance was placed either upon service tests or upon the appearance of the material and the opinion of its suitability from merely a superficial inspection. If the service test was used as a means of selection, a sample road was constructed with the material in question, and observed for a period of not less than one year. If the material proved satisfactory it was then used for more extensive construction. Naturally, this practice had a tendency to favor certain materials that had previously been used with success, since the expense of conducting service tests was great, and experimental construction with unknown materials was avoided as much as possible.

However, out of the use of these service tests have developed our modern tests of road materials. Engineers began studying the physical properties of materials that had been used successfully in road construction, and as a result worked out a system of tests which give an indication of the properties desired in only a few hours, where they had previausly waited at least a year before being able to come to any definite conclusions. These tests are so devised that they approximate conditions on the road, but the element of time is eliminated. Therefore, if we take advantage of the laboratory tests so devised we thereby profit by the experience of the past 40 years and save ourselves the expense and time necessary to make extensive service tests.

Present Practice in the United States

It is a deplorable fact that much work is being done in the United States without making either service or laboratory tests upon the materials used. This was considered poor practice forty years ago and should be looked upon at present as absolute folly. The service test is often absolutely out of the question, however, on account of the attitude of the people toward public improvements. Bonds for public improvement are never voted until that improvement is considered an absolute necessity. The public then demands the improvement at once, making it absolutely impossible to make any service tests upon materials that might be locally available.

Since service tests are out of the question, good judgment demands that we turn to the laboratory to get an estimate of the material we propose to use before investing large sums of money in experimental construction. Laboratory tests are conducted as a means of approximating the results to be obtained when using the material on the road, and by making them we simply insure ourselves against the expensive errors due to the use of improper materials.

Tests Necessary During Construction

The natural sources of material are of such a variable nature that they make it necessary to conduct tests during construction as well as before starting the work. Gravel, for example, should be tested before beginning construction. As the work progresses, material is taken from different parts of the pit, and as a result the material obtained is usually of a different nature from that of the original sample tested. Different parts of a gravel pit usually have different percentages of clay present and nearly always have a different variation in the sizes of particles making up the gravel. Since the preliminary tests of the material were not made upon samples that represent the gravel now being used, it therefore becomes necessary to make other tests as the work progresses. What is true of gravel pits is also true of other sources of natural materials as sand pits and even rock quarries, although it is not so pronounced in the latter case. In general, it may, therefore, be said that the sample must be truly representative of the material actually used in construction, or the testing is absolutely useless.

Tests Applied Should be According to the Function of the Material in the Structure

The laboratory tests applied to a material should be determined by the function of that material in the structure. For example, a rock that is to be used for water bound macadam construction should be tested differently from one to be used as an aggregate in a concrete pavement. Again, a rock that is to form a part of the aggregate in a concrete pavement should be tested differently if it is to be used as an aggregate in a reinforced concrete bridge. In explaining the tests in this bulletin it is the purpose of the author to try to show the relation of the tests used to the function of the material in the structure.

Tests Made Upon Gravel for Gravel Roads

Function of the Gravel.—Since the surface of the road is composed entirely of gravel it is necessary that it be of such a composition that it can withstand the effects of traffic without the addition of other material. This makes it necessary to have a combination of several important properties. As in the construction of a water bound macadam road, the material must be able to bear up under the weight of traffic, withstand the impact and abrasive action of the wheels and horses' hoofs, and must have enough cementing material in it to form a hard, impervious crust over the top of the road.

Character of Material.—Since the material is made up entirely of comparatively small pieces it is impossible to make a test for toughness. Even if there are pieces of sufficient size to make the toughness test, there may be so many different minerals in the gravel that a test upon one or two pieces would not be sufficient to give an indication of the toughness of all the particles. For these reasons it is necessary to give up the toughness test and instead make a classification of the materials making up the gravel so as to get an idea of the nature of the rock from which the gravel came. From what is known of the material from which the gravel originated it is possible to get some idea of its toughness and hardness.

Mechanical Analysis Test.—In order for the gravel to bear up under the weight of traffic it is necessary for it to possess some stability. If the particles making up the gravel vary in size so that the voids in the larger particles are filled with the smaller particles the resulting mixture will approach a solid in nature and consequently have a greater stability. To make this point plain let us assume a large number of round particles of exactly the same size. If these particles are placed in a pile it will be found that those underneath will roll out, allowing the pile to fall, while if a number of particles varying in size are placed together it will be possible to make a much higher pile without the particles underneath being displaced. It can be seen that there is a certain variation of sizes that is going to give the greatest stability. This variation in size can not always be obtained, but the nearer a material approaches it the more stable the mixture will be, and consequently the more desirable for purposes of construction, providing other properties are the same. For this reason a mechanical analysis is made of the gravel.

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*From "The Physical Testing of Non-Bituminous Road Materials," Bulletin No. 17, Texas Engineering Experiment Station; printed as Bulletin No. 12 of the Agricultural and Mechanical College of Texas, College Station, Texas.

†Assistant Professor of Highway Engineering, Agricultural and Mechanical College of Texas.

The following mechanical analysis limits are recommended by the United States Office of Public Roads for gravel to be used in the construction of gravel roads:

Base Course

All to pass a 2½-in. screen and to have at least 55 and not more than 75% retained on a ¼-in. screen.

At least 25 and not more than 75% of the total coarse aggregate (material over ¼ in. in size) to be retained on a 1-in. screen.

At least 65 and not more than 85% of the total fine aggregate (material under ¼ in. in size) to be retained on a 200-mesh sieve.

Top Course

All to pass a 1½-in. screen and to have at least 55 and not more than 75% retained on a ¼-in. screen.

At least 25 and not more than 75% of the total coarse aggregate to be retained on a ⅜-in. screen.

At least 65 and not more than 85% of the total fine aggregate to be retained on a 200-mesh sieve.

Abrasion Test.—The larger particles of gravel are forced to carry the greater part of the load of traffic and take the effect of abrasion caused by passing vehicles, the smaller particles lodging themselves between them, thus acting as binding material and promoting stability in the surface. Since the large particles must resist the abrasive action of traffic it is well to make the abrasion test upon them. The test is made exactly as described under "Tests Made Upon Rock for Water Bound Macadam Construction,"[2] except for the size of sample used. The sample of gravel used consists of pieces which pass a circular opening 2 in. in diameter and are retained upon a screen having circular openings ½ in. in diameter. Since this test gives an indication of the toughness and hardness it is interpreted in conjunction with the previous classification.

[The test referred to by Mr. Green is given in the following paragraph.—Ed.]

Abrasion Test.—Another test which gives an indication of the power to resist abrasion is known as the abrasion test. It measures not only the abrasive resisting properties, but also the toughness of the material. The test is made with the Deval abrasion machine. The machine consists of one or more cast iron cylinders, 8 in. in diameter by 13 in. long, mounted upon a shaft in such a way that their axes are inclined at an angle of 30 deg. with the line of the shaft. The test is made upon a 5-kg. (about 11-lb.) sample of rock made up as nearly as possible of 50 pieces of uniform size. Ten thousand revolutions of the shaft, at the rate of from 30 to 33 revolutions per minute, constitute a test. The percentage of material, by weight, worn off so as to pass a 1/16-in. mesh sieve is taken as an indication of the amount of wear. The amount of wear is either expressed as a percentage of the 5 kg., or as the French coeffcient of wear. The French coefficient of wear is more widely used and is equal to $\frac{400}{W}$, where W is the weight in grams of the detritus under 1/16-in. in diameter per kilogram of rock used. For roads carrying less than 100 vehicles per day the coefficient of wear should be from 5 to 8; for 100 to 200 vehicles, 9 to 15; for more than 250 vehicles a coefficient of 16 or over should be required.

Cementing Value.—Since the gravel makes up the entire surface it is necessary that it possess sufficient binding material to hold the particles together. When first constructed the larger particles are held together by means of the smaller particles of gravel and clay. The test of cementing value is, therefore, made upon the fine material below the ¼-in. sieve. As the surface wears away there must necessarily be new cementing material formed in order to preserve the road. A test is, therefore, made upon the material that is larger than ¼-in. in diameter and also upon the gravel as received. The test for cementing value is made exactly as described under "Tests Made Upon Rock for Water Bound Macadam Construction."

[This test, as described by Mr. Green, is given in the following paragraph.—Ed.]

Cementing Value.—Since the individual stones in the road must be cemented together by means of the rock powders it is necessary to determine their cementing value. A sample of the rock powders is prepared in the ball mill. Five hundred grams (about 1.1 lb.) of rock, broken to pass a ½-in. opening, are placed in the ball mill with 90 cu. cm. (about 0.2 lb.) of water and two steel shot weighing 20 lbs. The 90 cu. cm. of water is just sufficient to make a stiff paste of the rock powders. The sample is ground in the ball mill for 2½ hours at the rate of 2,000 revolutions per hour. The resulting paste is then taken from the ball mill and molded into briquettes 1 in. in diameter and 1 in. high by means of the briquette molding machine. The pressure exerted upon the briquette while being molded is 132 kg. per sq. cm. (1,877 lbs. per sq. in.). Five briquettes are made and allowed to dry in the air for 20 hours. They are then placed in an oven maintained at a temperature of 200° F. and heated for 4 hours. After removing the briquettes from the oven they are placed in a desiccator for 20 minutes and then tested in the impact machine * * * * The machine consists essentially of a 1-kg. (about 2.2 lbs.) hammer, which drops 1 cm. (about .39 in.), striking a plunger, which transmits the blow to the test piece below. The number of blows required to rupture the briquette is recorded upon a piece of silicated paper wrapped around the drum, and is taken as an indication of the cementing value of the rock powders. A result of 10 is low, 10 to 25 fair, 26 to 75 good; and over 100 excellent.

In the 1916 specifications for the wearing surface of a gravel road the United States Office of Public Roads requires: "The material passing a ¼-in. screen shall have, when tested in the manner described in Office of Public Roads Bulletin No. 44, cementing value of rock powders, a cementing value of not less than 50, and this material shall not contain more than 45 % of clay."

Percentage of Clay.—Practically all gravels are made up of more or less well rounded particles of rock mixed with sand and clay. There should be just enough sand to fill the voids in the rock and enough clay to fill the voids in the sand. This will make from 10 to 20% of clay which will act as a cementing medium. If the material contains more than this amount of clay the road constructed will be muddy in wet and dusty in dry weather, and consequently will not wear well. For these reasons a test of the percentage of clay is made on the gravel. There is no method, however, by which the exact amount of clay can be determined, but the following approximate method is ordinarily used: A sample of approximately 2,000 gm. is selected for the mechanical analysis test, and dried at 212° F. It is then placed in a shallow pan and water poured over it. The sample is then stirred for some time and allowed to settle for 15 seconds. The coarse material settled to the bottom during the 15 seconds and the water and suspended matter are then poured off. This operation is repeated until the water remains practically clear after stirring. The sample is then dried and the weight again taken. The loss in weight is taken as the amount of clay present and is expressed as a percentage of the total weight of the original sample.

Tests Made Upon Sand for Sand-Clay Roads

Function of Sand.—A good sand-clay road is made of a mixture of sand and clay in such proportions that the voids in the sand are just filled with the clay. This being true, the different particles of sand must be in contact with their neighbors. If they are not, there is an excess of clay in the mixture and during wet weather this clay will become plastic, allowing the sand grains to slide over each other, thus destroying the road surface. Since the clay only fills the voids in the sand, the function of the sand is to hold up the weight of traffic and furnish stability enough to keep the road

(*Continued on page* 89)

GOOD ROADS

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

AUGUST 18, 1917

DISTRIBUTION OF PRESSURE THROUGH FILLS

Data of considerable value to highway engineers should be obtained in the investigation of the transmission of pressure which is being conducted by the Office of Public Roads and Rural Engineering. An account of the work done by A. T. Goldbeck with earth fills is given elsewhere in this issue.

While great accuracy in data of this kind is seldom needed by the road builder, there are still many cases in which there is use for something more accurate than the usual assumptions as to the amount of pressure at a given point and the distribution of the total pressure. As pointed out by Mr. Goldbeck, it is desirable to extend the investigations to include other materials, as well as earth, and he states that further studies are to be made.

The results of this promised work will be interesting to engineers.

AN EXPERIMENT IN THE OPERATION OF GRADE CROSSING GATES

Gates at about one hundred and fifty grade crossings on the lines of certain railroads in New York State are to be kept closed from midnight until five o'clock in the morning, except when vehicles desire to cross the tracks. This method of operation has been ordered by the Public Service Commission as an experiment and, according to present plans, will commence on August 22 and continue for a year.

In some of the territory affected by the order the grade crossing hazard, always great, has assumed grave proportions. In some localities, notably in the vicinity of New York City, there is a very heavy traffic in the early morning hours. The number of vehicles on the roads between midnight and dawn is especially large at the week end, and there are probably more accidents in proportion to the total number of vehicles at night than during the day.

Gates which, in their normal position, close the highway would naturally be hardly feasible where vehicles cross the tracks almost constantly, but where vehicles are comparatively infrequent, or during periods of light traffic at any intersection, the plan should work well, especially if the gatemen are efficient. It will mean more work for all gatemen, and these men will have to be selected with some view to their willingness to act courteously and promptly. It will undoubtedly cost the railroads more for labor, but it is very likely that this increase will be offset by a decrease in legal expenses and damages. It will also delay motor traffic to a certain extent, but in view of the additional protection afforded this will be negligible.

The idea may not be entirely new, but it is certainly not commonly applied. The experiment may reasonably be expected to reduce the number of grade crossing accidents and to lead to the more extensive application of the plan or a modification of it.

BUILDING AND MAINTAINING FEDERAL AID ROADS

Because it emphasizes principles that are well known but often ignored in practice, the article by Col. Howard on building federal aid roads, printed elsewhere, is commended to the attention of road builders.

All of the reasons for honest, efficient work in the construction and maintenance of roads in general are equally valid reasons for good work in the building and upkeep of federal aid roads.

But in the latter case there is an added reason for bending every effort to the achievement of the best that is possible.

The application of federal funds to road work on a scale of any magnitude is a decided departure from former methods. It encountered no little opposition before it was finally enacted into law and there are still many engineers and officials who are opposed to the plan and skeptical of its working out satisfactorily.

Whether this opposition is overcome or given added strength depends very largely upon the way federal funds are used, upon the wisdom shown in selecting roads for aid, upon the choice of materials and methods of construction, upon the quality of supervision and inspection, and upon the manner in which all the various details of the work are carried out.

MARKETING FOODSTUFFS

It is of little use to raise crops of any kind unless they can be marketed, yet despite this very obvious fact efforts to increase the available food supply have been directed chiefly toward increasing production, and the equally important problem of marketing has received scant attention.

A large part of the cost of food is absorbed in charges for transportation—transportation from the fields and orchards to the shipping point, from the shipping point to the distributing center, from the distributing center to the retail dealer, and from the dealer to the consumer. A considerable portion of the transportation charge is the cost of the several handlings of the shipments, but there is also a heavy charge for the actual moving of the materials on the roads and railroads.

It seems likely at present that reductions in marketing costs, if made at all, will have to be made by the elimination of some of the handlings and by lower costs of hauling over the country roads. The same means will have to be employed, it seems, to prevent the waste of crops that under present conditions it does not pay to market.

Better buying and selling methods concern the road builder only as they do every citizen. In the cheapening of transportation over the rural roads, however, he is especially concerned. Road builders understand the problem and know the solution, and upon them rests the duty of educating the public to the need for well planned road systems properly built and carefully maintained.

Principles to be Observed in the Building of Federal Aid Roads

By J. W. HOWARD*

The timely paper on "Maintenance of Federal Aid Roads in Texas," read before the Texas Good Roads Association by J. D. Fauntleroy, District Engineer, Office of Public Roads and Rural Engineering, U. S. Department of Agriculture, and printed, in part, in "Good Roads" for July 28, sounds a most timely and important warning against the tendency of using state, county and federal aid funds for types of roads so thin and of so cheap and poor construction as to not adequately carry the prospectively heavy traffic of automobiles and to prevent future economical maintenance. It is better and in the end more economical to build thoroughly and permanently, so far as the available funds will permit, and thus to encourage the public to later provide reasonable funds eventually needed for maintenance. This policy is better and in the end cheaper than to build more miles of weak, cheap roads which will soon require heavy maintenance. Moreover, poor roads with weak wearing surfaces are periodically undulating, full of holes, and obstruct travel.

Mr. Fauntleroy wisely stated:

> Before building a road we should look ahead past the construction period to the maintenance which is to follow after, and endeavor to get a mental vision of how that road should look two or three or ten years hence. This is not a matter of mere conjecture, but, from information in hand, knowing the traffic that will traverse a road, we can determine, within reasonable limits, what the life of any particular class of road will be, and can also in like manner determine what the cost of maintaining that road should be. With such knowledge available it is criminal folly to go ahead and construct roads that will not answer the traffic requirements and that will either fail utterly, leaving only the debt to show that they were once constructed, or else they will have to be, at a future date, reconstructed at a much higher cost than would be the case had they been properly constructed of suitable materials in the first place. * * *
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> As soon as it is completed it seems, as if by magic, automobiles from all over the country at once learn of its location and seek it out. For example, when the post road between San Antonio and Austin was built, it was figured that 200 automobiles a day would be the maximum after the road was completed. As a matter of fact, during February of this year a traffic census was taken which showed that 931 cars per day was a fair average of the machines passing over this highway.
>
> Therefore, in building a road upon which we have reason to believe there is even a prospect of a largely increased traffic, we shoud figure that the maintenance of this road will eventually be much more costly than it would be under ordinary conditions.

Federal Aid Provisions

A study of the Federal Aid Road Act shows the following cardinal obligations of a state highway department on the one hand and of the Secretary of Agriculture of the federal department on the other hand:

1. It is the clear duty of the state highway department to initiate all projects for road building and designate those on which federal aid is asked, and for the Secretary of Agriculture to approve of the selection, if, in his judgment, the road is one on which federal aid should be granted, always limiting the federal appropriation to post roads or forest roads.

2. It is also the clear duty of the state highway department to designate the kind of road to be built, and submit specifications therefor to the Secretary of Agriculture when requesting his approval, for the proposed construction "substantial in character."

The portion of the Federal Aid Road Act, Public No. 156, 64th Congress, covering the foregoing duties of the state highway department and Secretary of Agriculture reads as follows:

> Sec. 6. That any state desiring to avail itself of the benefits of this Act shall, by its state highway department, submit to the Secretary of Agriculture project statements setting forth proposed construction of any rural post road or roads therein. If the Secretary of Agriculture approve a project, the state highway department shall furnish to him such surveys, plans, specifications, and estimates therefor as he may require; Provided, however, that the Secretary of Agriculture shall approve only such projects as may be substantial in character and the expenditure of funds thereby authorized shall be applied only to such improvements.

3. The next duty of the state highway department is to prepare plans, specifications and estimates and determine the percentage of federal aid desired, never exceeding 50% of the cost estimate, and never exceeding $10,000 per mi.; and it is the duty of the Secretary of Agriculture to consider the estimate and, if approved, to appropriate the funds from any unexpended balance of the annual federal aid allotment to such state as provided by the act, and to direct the treasurer of the United States to set aside such amount for such road project to be paid to the contractor as monthly estimates prepared by the state highway department and approved by the Secretary of Agriculture.

4. It then becomes the single duty of the state highway department to let the contract for such road under such specification, strictly in accordance with the highway laws of the state in which the work is to be done. Nothing in the act either makes the Secretary of Agriculture responsible or authorizes his action on the letting of the contract or conditions precedent thereto.

The portion of Section 6 of the Federal Aid Road Act covering the important features, Nos. 3 and 4 above, reads as follows:

> If the Secretary of Agriculture approve the plans, specifications and estimates, he shall notify the state highway department and immediately certify the fact to the Secretary of the Treasury. The Secretary of the Treasury shall thereupon set aside the share of the United States payable under this act on account of such project, which shall not exceed 50% of the total estimated cost thereof. No payment of any money apportioned under this act shall be made on any project until such statement of the project, and the plans, specifications and estimates therefor, shall have been submitted to and approved by the Secretary of Agriculture.
>
> When the Secretary of Agriculture shall find that any project so approved by him has been constructed in compliance with said plans and specifications, he shall cause to be paid to the proper authority of said state the amount set aside for said project: Provided, that the Secretary of Agriculture may, in his discretion, from time to time make payments on said construction as the same progresses, but these payments, including previous payments, if any, shall not be more than the United States' pro rata part of the value of the labor and materials which have been actually put into said construction in conformity to said plans and specifications; nor shall any such payment be in excess of $10,000 per mi., exclusive of the cost of bridges of more than 20 ft. clear span. The construction work and labor in each state shall be done in accordance with its laws, and under the direct supervision of the state highway department, subject to the inspection and approval of the Secretary of Agriculture and in accordance with the rules and regulations made pursuant to this act.

5. And now comes the greatest and again single responsibility of the state highway department, to wit, permanent maintenance of the road in good order and condition to the satisfaction of the Secretary of Agriculture, with the extreme penalty for non-compliance that the Secretary of Agriculture shall withhold all further federal aid to such state until all previously constructed federal aid roads have been put in good repair. The Federal Aid Road Act on this important point of maintenance reads as follows:

> Sec. 7. To maintain the roads constructed under the provisions of this act shall be the duty of the states, or their

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*Consulting Engineer, New York, N. Y.

civil subdivisions, according to the laws of the several states. If at any time the Secretary of Agriculture shall find that any road in any state constructed under the provisions of this act is not being properly maintained, he shall give notice of such fact to the highway department of such state, and if, within four months from the receipt of said notice said road has not been put in a proper condition of maintenance, then the Secretary of Agriculture shall thereafter refuse to approve any project for road construction in said State, or the civil subdivision thereof, as the fact may be, whose duty it is to maintain said road, until it has been put in a condition of proper maintenance.

Here is the vital importance to a state of Mr. Fauntleroy's caution to "look ahead, past the construction period, to the maintenance which is to follow," and to provide for the prospective traffic which will increase by leaps and bounds. Durable roads, cheaply maintained, are essential to secure federal approval and future federal aid.

It is reported, for instance, that the Georgia state highway officials have petitioned, or are about to petition, the Secretary of Agriculture to apply federal aid to a proposed sand-clay road (of short life and excessive maintenance cost, even in poor order) on the important thoroughfare extending between its two largest manufacturing and agricultural cities, Atlanta and Macon—a distance of about 75 mi. It is not known by the writer what action, if any, the Secretary of Agriculture has taken or will take. Whatever may be said of the suitability of sand-clay (relatively temporary) roads it is hard to conceive that anyone would seriously argue that, for such a thoroughfare as the one between Atlanta and Macon, a road of a mixture of sand and clay would lead to anything but immediate costly maintenance and poor maintenance, with the resulting withholding of federal aid on all other projects in that state until that road would be in good repair over its entire length of 75 mi.—an excessive and almost impossible continual expense to the state.

It is hard to conceive that the Secretary of Agriculture would give his approval to sand-clay or any weak road as "substantial in character" and such as would provide for present traffic, to say nothing of a prospective increase of traffic.

Durable Roads and Economical Maintenance

Surely, state highway departments and the Secretary of Agriculture will give serious consideration to Mr. Fauntleroy's timely caution to most carefully consider present and future traffic conditions and to select durable types of roads which are "substantial" and which a state highway department can reasonably and economically keep in such good repair that it will not become the legal duty of the Secretary of Agriculture to withhold further federal aid to a state because any previous federal aid road has been allowed to get into disrepair and has not been kept in "a condition of proper maintenance."

The experience of 80 years of the Department of Roads of France with thousands of miles of good roads, kept in good repair, is the reason for its national road policy that: "Economic, constant maintenance, and not low first cost, is the truest economy for roads and pavements." This is because maintenance, which must be paid from current public taxation, continues forever and finally constitutes the real cost to the people. A truly economical road is one having a suitable foundation with as durable as possible "substantial" wearing surface layer of proper depth, which can be constantly maintained in good and proper condition at little expense. This also enables a road to constantly fulfill its function of facilitating easy and rapid transit of vehicles for passengers and goods.

The Evergreen Highway is the name given to a proposed highway from Salt Lake City, Utah, to Vancouver, Wash., the route of which is being investigated. It is intended to make this a tourist highway open to travel all the year.

Physical Tests for the Materials Used in Building Gravel and Sand-Clay Roads

(*Continued from page 86.*)

in shape during wet weather. For these reasons the sand must be well graded and contain large particles. A fine sand has less stability than one grading from larger to smaller sizes, it even being advantageous to have small pieces of gravel in the mixture, providing there is a variation in sizes from the larger particles down to fine sand. The only tests ordinarily applied to this material are the mechanical analysis and void determination.

Mechanical Analysis Test.—Since the sand is depended upon to furnish stability to the mixture, and the clay simply holds the particles of sand together, it is absolutely necessary that the sand be graded in size so that it may have the necessary stability. The stability of any sand mixture may be increased by increasing the maximum size of the particles making up the mixture, providing the variation in size from the larger to the smaller particles is maintained. It is, therefore, very advantageous to have as coarse a sand as possible for this type of construction. The general tendency is to construct roads of this type using sands that are entirely too fine. To get an indication of the probable stability of the mixture the mechanical analysis test is made. The test is made as previously described under "Tests Made Upon Rock for Concrete Structures."

[This test is given, as described by Mr. Green, in the following paragraph.—Ed.]

The mechanical analysis test is made by separating a representative sample of the finished aggregate mixture into its various sizes by running it through a series of sieves and weighing the amounts retained upon each sieve.

Void Determination.—Since the voids in the sand are to be filled with the clay it is well to get some idea of the voids by laboratory methods. The test is made as follows: Five hundred cubic centimeters of sand are placed in a graduated cylinder and sufficient water is added to completely fill the voids. The volume of water added represents the space occupied by air. In order to get an accurate determination of the voids by this method it is necessary to introduce the water slowly, and at the same time the sand is placed in the cylinder, so that all air spaces may be eliminated. It is, of course, understood that the void determination is made only to get an indication of the approximate percentage of clay necessary, and the results are not to be taken as final but rather as a guide upon which to base an estimate of the proper amount of clay to be used. As work progresses observations on the road will give an indication of what percentages of material are best.

Clay for Sand-Clay Roads

Function of Clay.—In sand-clay construction the clay is added to the mixture so as to hold the particles of sand together during dry weather. The clay must be of such nature that it will not expand during wet weather to such an extent as to separate the sand particles, since this will destroy the stability of the mixture.

Implicit confidence can not be placed upon laboratory tests upon clay for sand-clay road construction. For this reason it is always advisable to first make laboratory tests to get some idea of the probable action of the clay in the mixture, and if it proves good, as indicated by laboratory methods, to then construct only a few miles of road with the material until it has proved its worth by actual wear on the road. The tests ordinarily applied are the slaking and shrinkage tests. Other tests are sometimes made, such as binding power and tensile strength, but these are not relied upon to give information of any great value.

Slaking Test.—There are two classes of clays, slaking and ball clays. Slaking clays readily crumble or slake when placed in water, while ball clays preserve their shape for some time. The slaking clays have the advantage that they readily mix with the sand and do not ball up when wet, but at the same time they possess the great disadvantage that they do not have such a high binding power as the ball clays. Clays that fall between these extremes are usually the best for road work. The slaking test is made upon both clay and sand-clay cylinders. Clay test pieces are made by mixing the clay with sufficient water to make a stiff paste from which cylinders 1x3 in. are molded. After the cylinders have been dried in a steam bath at 212° F., then immersed in water at 40° F., it should take at least two minutes and preferably six minutes for the cylinders to crumble and fall to the natural slope of the material.

Shrinkage Test.—If there is sufficient clay in a sand-clay road to fill the voids in the sand when in a dry condition and the clay is of such a nature that it expands when wet, the sand grains will necessarily be forced away from each other, thus breaking up the stability of the surface mixture. If this expansion can be reduced to a minimum a more nearly stable mixture will result. To get an indication of this expansion the shrinkage test is made. In general the clay having the lowest per cent. shrinkage is the most desirable, provided the low shrinkage is not obtained at the expense of binding power. Test pieces are made by mixing sufficient water with the clay to form a stiff paste. Bars approximately 4 in. in length and 1 in. thick are molded from this paste, or the test pieces for the slaking test may be used. Marks are placed upon the test pieces as far apart as possible and the distance between them accurately measured while the paste is yet green. After the bars have been dried the distance between the marks is again measured and the difference in the two measurements is taken as the shrinkage. It is expressed as a percentage of the original distance between the two marks.

Thumb Test.—Another extremely simple test is sometimes made to get an idea of the binding value of the material and is known as the thumb test. The test consists of wetting the thumb and placing it against the clay. If the clay sticks to the thumb it is said to have some binding value, while if it does not it is safe to assume that it has none.

New York State Road Map

The road map of New York State, recently issued by the New York State Commission of Highways, shows 6,500 mi. of completed state and county highways, 1,500 mi. of state and county highways under construction, 4,300 mi. of roads that have been improved by towns or counties, and approximately 6,500 mi. of unimproved roads. There are about 80,000 mi. of highways in the state, outside of the limits of cities and incorporated villages.

On the reverse side of the map is given information concerning historical places that are indicated on the map by numbers within circles.

The map is printed in black and white, is 41 by 35-½ in. in size, and is drawn on a scale of 5 miles to the inch. It supersedes a similar map issued about a year ago.

Results of Bidding for Pennsylvania Highway Work

Excessively high bidding for road work to be done in Cambria, Lehigh, Dauphin and Lackawanna Counties, Pennsylvania, outlined in the issue of July 28, resulted in the rejection by the State Highway Commissioner of all bids received for work in those counties.

It was stated that a contract for the state aid improvement proposed for Shickashinny Borough, Luzerne County, would be awarded to O'Brien Brothers, of Avoca, who made a satisfactory bid of $51,178.70. The bid of Gibbons & Buckley, of Philadelphia, was $51,181.81.

The bids that were received on July 24 for road work in Foster Township, McKean County, were also found to be too high.

A contract for grading and draining a portion of State Highway Route 51 in Somerset County was let to R. B. Taylor, of Bellefonte, who, on July 24, submitted a bid of $81,428.35.

Weighing Highway Traffic in Iowa

For the purpose of determining the type of surfacing best suited to the improvement of certain roads and to provide a basis for the division of taxes, surveys of highway traffic are being conducted in Iowa by the State Highway Commission and the Engineering Experiment Station at Ames.

A count was taken on the Ames-Des Moines Road by means of a set of road scales which resulted in the weighing of 4,919,456 lb. during a 10-day period. The traffic making up this weight consisted of 1,394 touring cars, 213 roadsters, 59 motorcycles, 41 bicycles, 44 motor trucks, 1 tractor, 232 horse-drawn vehicles (172 carrying passengers, and 61 freight), 3 wagons, 1 planter and 2 horses. The larger number of vehicles represented interurban traffic.

Road Repair Work in Mercer County, New Jersey

A report of the County Road Repair Department of Mercer County, New Jersey, for the months of May and June, shows an expenditure for road repair amounting to $50,000, the expenditure for June being more than $3,000 the greater. It is stated that the general condition of the roads is better than in any previous year, due to the larger amount of work done up to the time covered by the report.

Of the 65 county roads, 32 have been repaired for a distance of about 100 mi. The total mileage of roads controlled by the county is 165. The principal highways upon which repairs have been made are the Scotch Road, Trenton and Lawrenceville, Lawrenceville and Princeton, Trenton and Crosswicks, Edinburg and Windsor, Woodsville, Brunswick Pike, Groveville, Yardville and Allentown, Liberty Street, White Horse extension, Hutchinson Mills, Hightstown and Cranbury, and River Road.

Mercer County's share of the motor vehicle fund for this year is $65,000.

NEWS NOTES

The Byron Center Road in Kent County, Michigan, is to be improved with concrete at a cost of $99,172. The highway is 7¼ mi. in length. The contract calls for the completion of the work by Aug. 1, 1918.

A Road Bond Issue of $275,000 is proposed for Charleston County, South Carolina. An election has been called for Aug. 29 to give the people of the county an opportunity to decide the question.

The Completion by the State of All Highway Improvements in cases where contractors have been unable to finish the work within the specified time, was recently recommended by Governor Cox of Ohio to the Highway Advisory Commission.

Street Paving in Progress at Providence, R. I., includes the laying of bitulithic on South Main St., from East Main to Globe Corners; asphalt on Prospect St., from Hanover to cemetery gate; and macadam on Dwelly St., from Tuttle to South Main.

MEETINGS

Calendar of Coming Meetings

August 22.—Union of New Brunswick Municipalities.—Annual convention, St. John, N. B. Secretary, James King Kelley, St. John, N. B.

August 27-29.—Union of Canadian Municipalities.—Annual convention, London, Ont. Secretary, W. D. Lighthall, K.C., Westmount, P. Q.

Aug. 29-31.—Ontario Municipal Association.—Annual convention, Toronto, Ont. Secretary, B. H. Spence, 705 Lumsden Building, Toronto, Ont.

Sept. 5-8.—League of American Municipalities.—Annual convention, Gary, Ind. Secretary, Robert E. Lee, City Hall, Baltimore, Md.

Sept. 11-13.—American Association of Park Superintendents.—Annual convention, St. Louis, Mo. Secretary, Roland W. Cotterill, 533 City Hall, Seattle, Wash

Sept. 18-20.—League of Iowa Municipalities.—Annual convention, Iowa City, Ia. Secretary, Frank G. Pierce, Marshalltown, Ia.

Sept 18-20.—League of Virginia Municipalities.—Annual convention, Lynchburg, Va. Secretary, L. C. Brinson, Portsmouth, Va.

Sept. 24-29.—League of California Municipalities.—Annual convention, Santa Rosa, Cal. Secretary, Wm. J. Locke, Pacific Building, San Francisco, Cal.

Oct. 17-18.—League of Minnesota Municipalities.—Fifth annual convention, St. Cloud, Minn. Secretary-Treasurer, Richard R. Price, University of Minnesota, Minneapolis.

Nov. 19-24.—City Managers' Association.—Annual meeting, Detroit, Mich. Secretary, W. L. Miller, City Manager, St. Augustine, Fla.

Nov. 21-24.—National Municipal League.—Twenty-third annual meeting, Hotel Statler, Detroit, Mich. Secretary, Clinton R. Woodruff, 703 North American Building, Philadelphia, Pa.

Portland Cement Association

The fall convention of the Portland Cement Association will be held at the Blackstone Hotel, Chicago, Ill., on Sept. 10 to 13, inclusive.

Good Roads Field Day in Michigan

As noted in the issue of Aug. 11, a Good Roads Field Day will be held at Cass City, Mich., on Aug. 24, under the auspices of the Michigan State Good Roads Association, the West Michigan Pike Association, and other highway organizations. Visitors from the western part of the state will leave Grand Rapids Thursday, Aug. 23, at 8:00 a. m., and motor to Saginaw, where Thursday night will be spent. Saginaw and Bay City visitors will join the party here and on Friday morning the tour will continue to Cass City. Members of the Detroit Automobile Club will go from Detroit. The program follows:

1:00 p. m.—Address of welcome, J. D. Young, of Cass City; Response by the chairman of the day, W. H. Loutit, President, West Michigan Pike Association; "Michigan," Gov. Albert E. Sleeper; "Our Highway Department," Frank F. Rogers, State Highway Commissioner; "Good Roads and the Farmer," John I. Gibson, Secretary, Western Michigan Development Bureau; "Good Roads and the Automobile," Wm. E. Metzger, President, Detroit Automobile Club; "Heavy Traffic Roads," Edward N. Hines, Chairman, Wayne County Road Commission; "The Cause We Love," P. T. Colgrove, President, Michigan State Good Roads Association; Presentation, Earle Monument, Dr. Wm. DeKleine; Unveiling of monument, Miss Retta Hooper, Cass City; Response, Horatio S. Earle.

Ontario Municipal Association

The nineteenth annual meeting of the Ontario Municipal Association will be held at the City Hall, Toronto, from the 29th to the 31st of the month. Municipal councils throughout Ontario are invited to participate in the convention.

Registration of members will begin at 9.00 a. m. Wednesday, Aug. 29, followed by the opening addresses, report of the executive committee and the appointment of committees. Papers on various municipal subjects will be heard during Wednesday and Thursday, and on Friday morning. S. L. Squire, Municipal Adviser of the Provincial Highways Department, will speak on "Good Roads as a Municipal Problem."

A meeting said to be the first good roads convention in the history of Alberta, Canada, was held at Calgary on Aug. 2, the object of the meeting being to secure unity of effort on the part of automobile associations for the improvement of roads in the province. The Canadian Motorists' Association, the Manitoba Motor League and the Calgary Auto Club, as well as other organizations, were represented by their officers, who addressed the meeting. The program included a run by automobile to the Banff resort in the Canadian Rockies.

PERSONAL NOTES

Henry Dennen has resigned as City Engineer of Jackson, Ky., on account of illness.

George Wells has been appointed Chief Highway Engineer of Pike County, Kentucky.

G. M. Middleton, County Road Engineer of Shelby County, Kentucky, has resigned to take effect Nov. 1.

Edward A. Beck has been appointed City Manager of Goldsboro, N. C., to take effect Sept. 1, at a salary of $275 per month.

Ray S. Blinn, formerly City Paving Engineer of Columbus, Ohio, and recently City Manager of Westerville, Ohio, has resigned to enter the contracting business.

Boyd Walker is Acting County Engineer of Pottawattamie County, Iowa, during the absence of County Engineer Marshall, who has been made captain of an engineer company.

D. W. Spence, Dean of Engineering of the Agricultural and Mechanical College of Texas, died recently at Galveston. He had been connected with the A. & M. College since 1890, first as Assistant Professor of Civil Engineering, and since 1913 as Dean of Engineering and Professor of Civil Engineering.

Wm. Smith has been made City Engineer of Jackson, Ky., taking the place of Henry Dennen, resigned.

George Bromley Kirkpatrick, for many years Director of Surveys for the Province of Ontario, Canada, died at his home in Toronto on Aug. 3. He was a native of Dublin, Ireland, and a graduate of Trinity College.

PUBLICATIONS

MISSOURI HIGHWAY BULLETIN, Vol. I, No. 1; issued by the Missouri State Highway Department. Paper, 6x9 in., 48 pp.

The primary purpose of the Missouri Highway Bulletin, as given in the foreword, is to encourage the improvement of state and county highways as provided by the new road law and correlated measures. It contains among other things a resume of new legislation pertaining to roads, the federal aid road act, and an extract from the inaugural address by Gov. Frederick D. Gardner, in which he urged the enactment of a law creating a state highway department with broad powers.

ONTARIO, CANADA, DEPARTMENT OF PUBLIC HIGHWAYS: "Specifications for Bituminous Materials." Publication No. 24, July, 1917; appendix to the annual report of the Department of Public Highways of Ontario. Paper, 6½x9¾ in., 7 pp. and covers.

This bulletin is issued as an appendix to the annual report of the Department of Public Highways of Ontario, in connection with Bulletin 23—"Methods of Applying Bituminous Materials," noted in this column. The specifications given are for light asphaltic road oils, medium asphaltic road oils, heavy asphaltic road oils, asphalt binders, refined coal tars, cold application; refined coal tars, hot application; and refined coal tar binders.

TEXAS AGRICULTURAL AND MECHANICAL COLLEGE: "The Physical Testing of Non-Bituminous Road Materials," by Roy M. Green, Assistant Professor of Highway Engineering, Texas Agricultural and Mechanical College; Bulletin 17 of the Texas Engineering Experiment Station. Paper, 6x9 in., 27 pp. and covers; illustrated.

The above publication is one of the semi-monthly bulletins issued by the Agricultural and Mechanical College of Texas. The introductory section relates briefly to present practice of testing materials, tests that are necessary during construction, and tests as applied to the function of the material in the structure. Four sections are devoted to tests made upon rock—(1) for water bound macadam construction, (2) for bituminous roads and pavements, (3) for cement concrete pavements, and (4) for concrete structures. These are illustrated by halftones showing the apparatus used for making the tests. Two sections are devoted to tests made upon gravel, one for gravel roads and the other for concrete structures, and two sections to tests on sand for sand-clay roads, and cement concrete construction. The remaining tests given are for clay for sand-clay roads, paving brick and paving block, and stone for stone block pavement. The bulletin also contains instructions as to the selection and submission of samples for testing, with a list of bulletins issued by the Texas Engineering Experiment Station.

BITUMINOUS SURFACES FOR MACADAM ROADS; 'The Selection of Materials and Methods of Testing. Ontario Department of Public Highways, Publication No. 23, July, 1917. Appendix to the annual report of the Department of Public Highways. Ontario, Canada. Paper, 6½x9½ in., 22 pp. and covers; illustrated.

This appendix to the annual report of the Department of Public Highways of Ontario, which is issued as a manual, deals first in a general way with types of surfaces and materials used. This is followed by a section on the methods of applying bituminous materials, including the cold surface and the hot surface treatments, and surface binders by the penetration method. The larger portion of the publication is devoted to "Methods Used in the Testing of Bituminous Materials," in which a description of 14 tests is given, as follows: Dehydration and determination of water content; specific gravity; specific viscosity; open flash point; determination of total bitumen; determination of asphaltenes; fixed carbon determination; determination of paraffin scale; volatilization test at 163° C.; float test; penetration test; ductility test; distillation test; determination of melting point. The concluding sections give instructions for taking and shipping samples for testing, and suggestions regarding tenders for bituminous materials. The illustrations consist chiefly of diagrams.

ILLINOIS STATE HIGHWAY DEPARTMENT: "The Testing of Road Oils"; Bulletin No. 13, prepared by F. L. Roman Testing Engineer, Illinois State Highway Department. Paper, 6x9 in., 29 pp. and covers; illustrated.

This bulletin is intended to present to highway engineers and others information in a readily available form on the specifications involved in the use of road oils. It first gives the sources and character of road oils and their chemical composition. The tests are then given in the following order: Specific gravity, specific viscosity, volatilization loss, solid residue, flash and burning points, total bitumen, bitumen insoluble in paraffin naphtha, fixed carbon, paraffin scale. There are nine outline drawings illustrating the apparatus used in making the various tests.

NEWS NOTES

A Municipal Paving Company for Oklahoma City, Okla., has been suggested by Mayor Overholser, to do away with competitive bidding.

A Resolution Requiring Freshly Oiled Roads in New Jersey to be immediately sprinkled with sand was recently adopted by the State Highway Commission. An effort will be made to secure legislation prescribing a penalty for failure on the part of a contractor to comply with this provision.

The Lake of the Isles, Calhoun, and William Berry Park Driveways in Minneapolis, Minn., will be improved if the plans of the improvement committee of the Park Board are adopted. The estimated cost of the work is $558,000. It is proposed to raise the money by bond issue to be placed on the 1917 assessment roll.

A Bill Intended Primarily to Permit the Wealthier Counties of Georgia to assist the poorer ones in the construction of continuous highways has passed the State Senate. It provides that counties may vote joint bonds for the improvement and maintenance of intercounty roads, and divide the expense as may be agreed upon between them.

The Qualified Voters of Mississippi County, Missouri, on July 28, adopted a $375,000 bond issue for road and bridge purposes by a vote of ten to one. Business houses closed for the occasion and people attended the meeting from every section of the county. The vote of ten to one entitles Mississippi County to first place in the good roads movement in Missouri, St. Louis County being next with a majority of six to one.

The Road Board of Bibb County, Georgia, at a recent meeting adopted a resolution providing for the appointment of a committee to have charge of the purchasing of materials to be used in road construction. It was also decided that bids for such material as well as statements relating to expenditures for labor and equipment should be advertised in the Macon daily papers for the information of taxpayers.

The Chamber of Commerce of New Albany, Indiana, by requesting the County Commissioners to petition the State Highway Commission for the construction of a main road extending from Floyd County to Evansville, took initial action toward the improvement of a state system of market roads under the new law. The proposed highway is 160 mi. in length, its estimated cost being $1,400,000. The commission is authorized to designate 2,000 mi. of main highways, serving the more populated sections and the requirements of communities throughout the state.

GOOD ROADS

A Weekly Journal of Road and Street Engineering and Contracting

Old Series, Vol. LII
New Series, Vol. XIV

NEW YORK, AUGUST 25, 1917

Number [illegible]

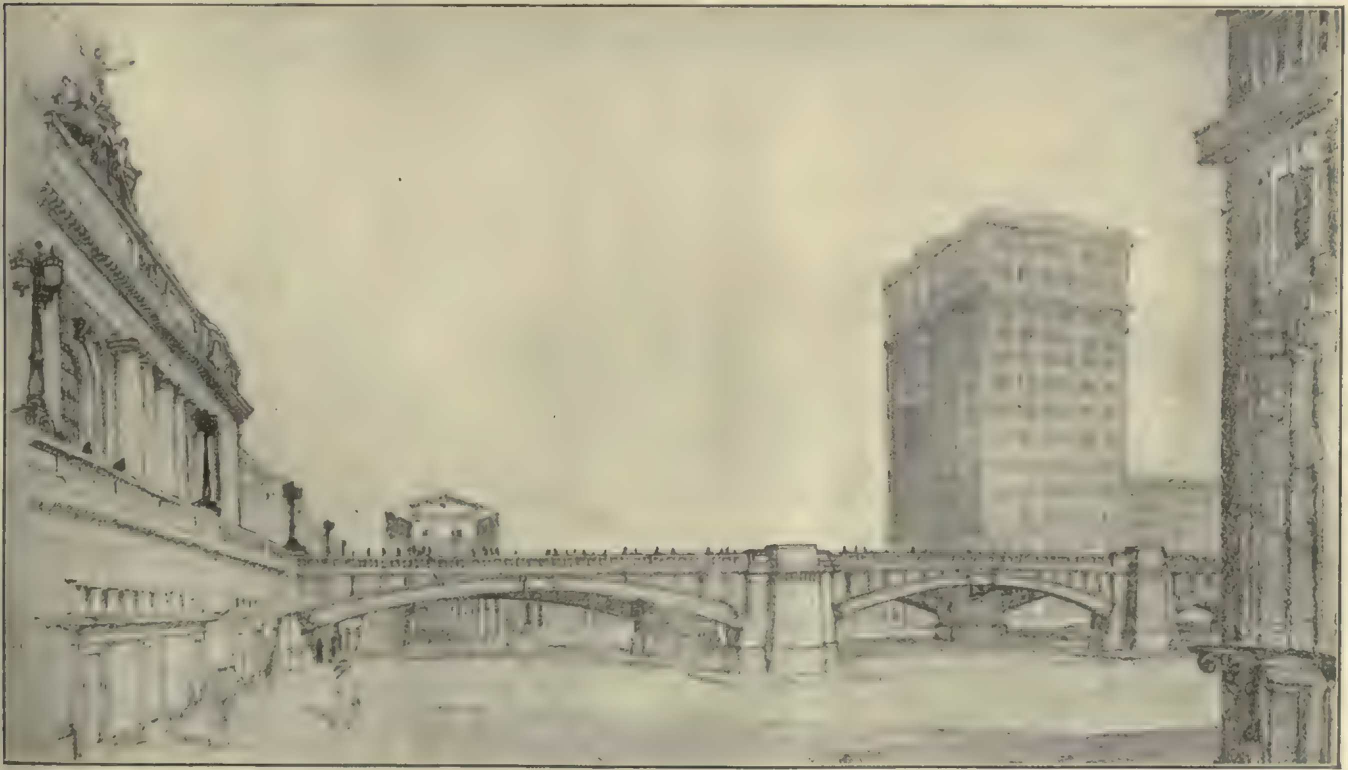
Viaduct for Grade Separation at Park Avenue and 42d Street, New York City

The separation of grades at an important street intersection in New York City is to be accomplished by Borough President Marks of Manhattan through the construction of a viaduct two city blocks in length. The structure, which will be known as the Park Avenue Viaduct, will extend from 40th St. northerly, crossing 41st and 42d Streets and connecting with the driveway on the Grand Central Terminal on the north side of 42d St. A view of the structure is shown in the accompanying illustration.

Contracts for the work were received recently by Borough President Marks, the lowest being a little more than $500,000. This was some $75,000 in excess of the amount available for the work, and application was made to the Board of Estimate and Apportionment to authorize the additional funds necessary. This authorization has been allowed by the board, but must still be acted upon by the Board of Aldermen, which does not meet until next month. While this means that the execution of the contract will be delayed for a number of weeks, it is believed certain that work will be commenced during the current year.

At present there is a roadway on the west and east sides, and on the south, or front, of the Grand Central Terminal, This is an integral part of the terminal building and is carried on top of the stores and entrances to the station on 42d St. Park Avenue, which is interrupted by the railroad station, carries a double street car line running in a tunnel from 34th St. to 40th St. and in an open cut from 40th St. to 42d St. At 42d St. these tracks turn to the west and connect with the double track line on 42d St. Parking spaces over the street car tunnel divide the avenue into north and south bound roadways which continue on each side of the open cut between 40th and 42d Sts., and 41st St. is not continuous across the avenue.

The new structure will be a steel viaduct, beginning at the northerly line of 40th St. and extending to the roadway around the Grand Central Terminal. Park Avenue traffic for beyond 42d St. will go over the viaduct and thence continue northerly to 45th St. on this roadway. Under the original agreement which the previous administration made with the New York Central Railroad, only the portion of its drive-



VIADUCT TO BE BUILT ON PARK AVENUE, BETWEEN 40TH AND 42D STREETS, BOROUGH OF MANHATTAN, NEW YORK CITY.

way along 42d St. west of the viaduct, and the driveway on the westerly side were to be used by city traffic. The other side was reserved as a private roadway to serve the station and the Hotel Commodore which is being built just east of the terminal. Borough President Marks is now negotiating, however, for the use of the east driveway by the city and, if successful, northbound traffic will turn east at the station and continue to 45th St. over the east driveway, while southbound traffic from 45th St. will come down the west driveway and then across the viaduct.

The viaduct will consist of three spans, 136 ft. long, center to center. Although the spans are built to have the appearance of steel arches, the load is really carried by heavy steel girders, cantilevered from the steel columns and continuous across the columns. The granite piers shown in the illustration are merely ornamental, the steel supporting columns extending down inside them either to the roof of the subway underneath or to bedrock. At the southerly end there is an approach between 180 and 190 ft. long. This consists of granite side walls surrounding steel work spanning the street car tracks on Park Ave. The viaduct will carry a roadway 36 ft. wide in the clear, with no sidewalks. It has been designed for a live load equivalent to a 30-ton truck.

When the viaduct is completed the Park Ave. tracks, after emerging from the approach at the southerly end of the structure, will continue under the main portion of the viaduct to 42d St., as at present, but will be raised to meet 41st St., which they will cross at grade. Park Ave. traffic between 40th and 42d Sts. will continue along the roadway at either side of the viaduct.

The design of the structure is complicated by the extensive subway construction in that section of the city. The viaduct will be over parts of the existing Interborough Subway under 42d St. and Park Ave. and a connection between the present subway and the Lexington Ave. Subway, which is under construction. The columns supporting the viaduct rest either upon the subway roof or are carried to bedrock below the subway, which, in cases, has necessitated carrying the viaduct columns on girders spanning the subway tracks.

As a result of persistent urging and cooperation by Borough President Marks, the actual construction of this most important improvement will begin this fall.

Iowa's Road Patrol Law

The weekly inspection of roads in Iowa is a requirement of Iowa's patrol law which went into effect July 4. The efficiency of the law will depend upon the manner in which it is carried out by the various boards of supervisors under whose jurisdiction the work of patrolling the roads is done. The specific provisions of the law are as follows:

Section 1. Boards of supervisors shall cause all of the highways in their jurisdiction to be patroled as hereinafter provided, and to carry out the provisions of this act they are hereby empowered and required to appoint patrolmen for the county road system, and fix their compensaton, who shall be known as county road patrolmen and who shall hold their office during the pleasure of the board so appointing them.

Section 2. The road patrolmen shall give their entire time to road work from the beginning of the road working season in the spring until its close in the fall of the year and such additional time as the board of supervisors may direct.

Section 3. Boards of supervisors shall assign, allot, or parcel out to the county patrolmen such sections of road or roads as they can patrol and properly care for, and it shall be the duty of the county patrolmen to go over all the roads in their respective sections at least once each week, and said patrolmen shall make extra visits to such roads or bridges as may be reported in need of attention.

Section 4. It shall be the duty of the patrolmen herein provided to drag or cause to be dragged after each rain and at such other times as may be necessary all the county roads that lie within their respective sections, and to remove all trash, debris or other inpediments from the entrance to sluices, culverts and bridges, and keep the same and their outlets open and free from obstructions. They shall keep the side ditches along the grade open and provide said ditches with ample outlets. They shall remove loose stones and other impediments from the beaten track of the highway, fill depressions and keep the roads free from ruts, water pockets and mud holes, and shall repair approaches to bridges and culverts and keep the said approaches smooth and free from bumps, and shall perform such other duties and comply with such rules and regulations as may be provided by the board of supervisors.

Section 5. Boards of supervisors shall provide patrolmen with such tools and equipment as are necessary to carry out the provisions of this act, and said patrolmen shall receipt to the board of supervisors therefor. Said patrolmen shall give bonds for the faithful performance of their duties and the care of tools and equipment in such sum as the board of supervisors may direct, which bond shall be approved by the board.

Map of Kansas Highways

The State Highway Commission of Kansas has completed the work of locating the roads in the state system and has ordered the prepartion of a map showing the 6,200 mi. of highways included. The map, of which 10,000 copies will be made, will be printed for general distribution.

Resignation of State Highway Commissioner Frank B. Black of Pennsylvania

The resignation of State Highway Commissioner Black as head of the State Highway Department, of Pennsylvania, became effective Aug. 15, and, as reported, was the outcome of a controversy with Governor Brumbaugh, by whom he was appointed to the office of commissioner on July 5, 1916, succeeding Robert J. Cunningham, deceased. His letter of resignation has been quoted, in part, as follows:

"Your criticism of this method of procedure (distribution of state funds to counties) is not well taken, as you touch it in too small a way. It is a proposition that affects the entire state and the people are certainly entitled to know what disposition is being made of the money. All the statements made by you are made with a view of beclouding the real issue for requesting my resignation. It has been my aim to run the department along business lines instead of being used as a political asset. I have refused consistently to turn the department into a political machine."

Class "A" Road Apportionments in West Virginia

Although the work of locating and establishing all the Class "A" roads in the State of West Virginia has not been completed it has proceeded sufficiently, and sufficient funds have been collected to permit an approximate apportionment to be made and certified to the counties, so that the various county courts may make proper estimates for levies as provided by the law passed at the legislative session of 1917, relating to the construction and maintenance of Class "A" roads. The State Road Commission reports the following collections:

Automobile licenses	$291,102.81
Dealers' licenses	6,075.56
Chauffeurs' licenses	4,322.05
Motorcycle licenses	3,001.19
Dealers' motorcycle licenses	105.08
Total	$304,606.19
Refund to county and state institutions	128.90
Balance	$304,477.29
Total expenditures to date, including tags	18,252.52
Net balance	$286,224.77
From Federal Government, 1917 apportionment	53,270.46
From Federal Government, 1918 apportionment	106,540.92
Total balance of fund	$446,036.15

The commission finds that there are approximately 4,588 mi. of Class "A" roads, to which it apportions $435,860, believing that the collections for the remainder of the fiscal year will take care of the unexpended appropriations for the administration work of the department. The apportionment is made to counties on the basis of mileage.

The Maintenance of Gravel Roads*

By FRANK F. ROGERS†

To maintain a gravel road in a satisfactory condition it must have constant attention. With proper care in the early spring, followed by continued dragging and the repair of little defects that develop throughout the season, gravel can, unless entirely unsuited to traffic, be maintained in a condition highly satisfactory to the users; the necessity of early resurfacing or reconstruction is also forestalled at a consequent saving in cost, which will more than compensate the added cost of maintenance.

Realizing the necessity of continued maintenance, the 1917 Legislature enacted into the state reward law the following provision:

> It shall be the duty of the road officials of every county, good roads district or township in which state rewarded roads have been built to organize an adequate, efficient and continuous system of maintenance for all such roads, which system must be approved by the State Highway Commissioner, in order to make such county, good roads district, or township eligible to any further state reward; and counties, good roads districts, or townships which have not heretofore, but may hereafter build state rewarded roads, shall organize such system of maintenance before any state reward is paid to such county, good roads district or township.

Substantial compliance with the provisions of the above amendment will necessitate the employment of a patrolman where sufficient mileage of continuous or nearly continuous road is constructed to require the full time of one man—say from 4 to 8 mi., depending upon the travel. Other requirements will be the provision of suitable tools, the stocking of material along the road for making repairs, and the efficient supervision of the work.

Maintenance should begin as soon as the road is opened to traffic. The necessity of giving a gravel road proper attention, especially during the formative period, led the department to incorporate the following into the latest specifications for gravel roads:

> No gravel surfaced road will be accepted for state reward until a suitable road drag or float has been provided and arrangements made with some person living on or near the road to keep it floated after rains until thoroughly compacted, so as to insure that the gravel packs down evenly and forms a surface free from humps and hollows. It is also required that at least 20 yd. of gravel to each mile be placed in a neat pile near the road so that it may be used as may be required in filling hollows after rains.

The maintenance and repair of gravel roads will be considered next under three heads: (1) dragging, (2) patching, (3) resurfacing.

Dragging

Gravel roads are never hard enough and smooth enough when opened to travel to prevent almost immediate rutting by the wheels of heavily loaded wagons. In fact, a gravel which contains enough clay to pack immediately under the roller, or in a few days under travel, will always prove to be a muddy road when the frost is going out in the spring, and in prolonged wet spells at other seasons of the year. If such gravels are found on a road they can be greatly improved by covering with a thin layer of sandy gravel, applied when the old gravel is soft and allowed to mix under travel, the road being kept smooth by the frequent use of the road drag.

On any gravel road, dragging with a suitable road drag should begin after the first good rain following the completion of the road and be continued after each subsequent rain until the road surface becomes so hard and smooth that heavily loaded wagons make no impression on the road surface. This means that the dragging must be frequent the first fall until winter sets in and the following spring until the middle of May or the first of June. After that, the dragging will not be very effective, unless the rains are of long enough duration to slightly soften the surface, and may, therefore, be less frequent. But dragging will still be found very effective and efficient in the late fall and in the spring, when the frost is coming out and before the gravel is fully settled.

The plank drag, the log drag, or the various forms of steel drags will be satisfactory for this work. When wooden drags are used, they should be faced with some kind of steel plates.

Patching

This work is usually neglected or done in such a way as to cause two ruts to form where there was but one before. That is the invariable result of filling a rut too full. This work should always be done when the road is wet, preferably when the water is still standing in every little hollow on the road surface, so that the workmen can see just where to place the new gravel and about how much is required.

Unless the rut is a very large one, it is always best to shovel the gravel from the wagon into it, rather than to raise a sideboard and attempt to dump a part of the load.

Patching done in the proper manner when the road is wet, followed by the road drag, will maintain an old gravel road surface as good as new until it is so badly worn that an entirely new surface is required. The gravel used should never be poorer than that forming the surface layer of the old road, and especially should not contain an excess of clay. The best results will be obtained by using the same kind of gravel as was used to build the old road.

This kind of patching should never be done when the old roadbed is hard and dry, for then the new material is soon ground into powder and makes dust and mud.

Resurfacing

The work of resurfacing an old road is much the same as putting on the top layer of gravel when building a new road. If the layer is to be more than 3 in. thick, it will often be necessary to form slight shoulders by scraping the loose and worn material from the central portion of the roadbed to the sides. Frequently the crown has all been worn off the old roadbed, and sometimes more, leaving the old road surface concave or "dished." In such cases the new gravel will have to be thicker in the center and "feathered" out at the edges. The new gravel can be kept in proper crown by the frequent use of the road drag, as already described, sometimes supplemented by the use of a road grader.

It should be needless to add that the best gravel obtainable ought to be used for resurfacing. It is also best to do this work in the spring or fall when the old bed is not too hard, so as to prevent any of the new gravel from being ground up under the wheels of heavily loaded wagons, especially if any part of the new layer is less than 3 in. thick.

The gutters and ditches must at all times be kept clear of dirt, rubbish, weeds and brush, so that the water always has a free and unobstructed flow to the nearest drains, which can remove it permanently from the road.

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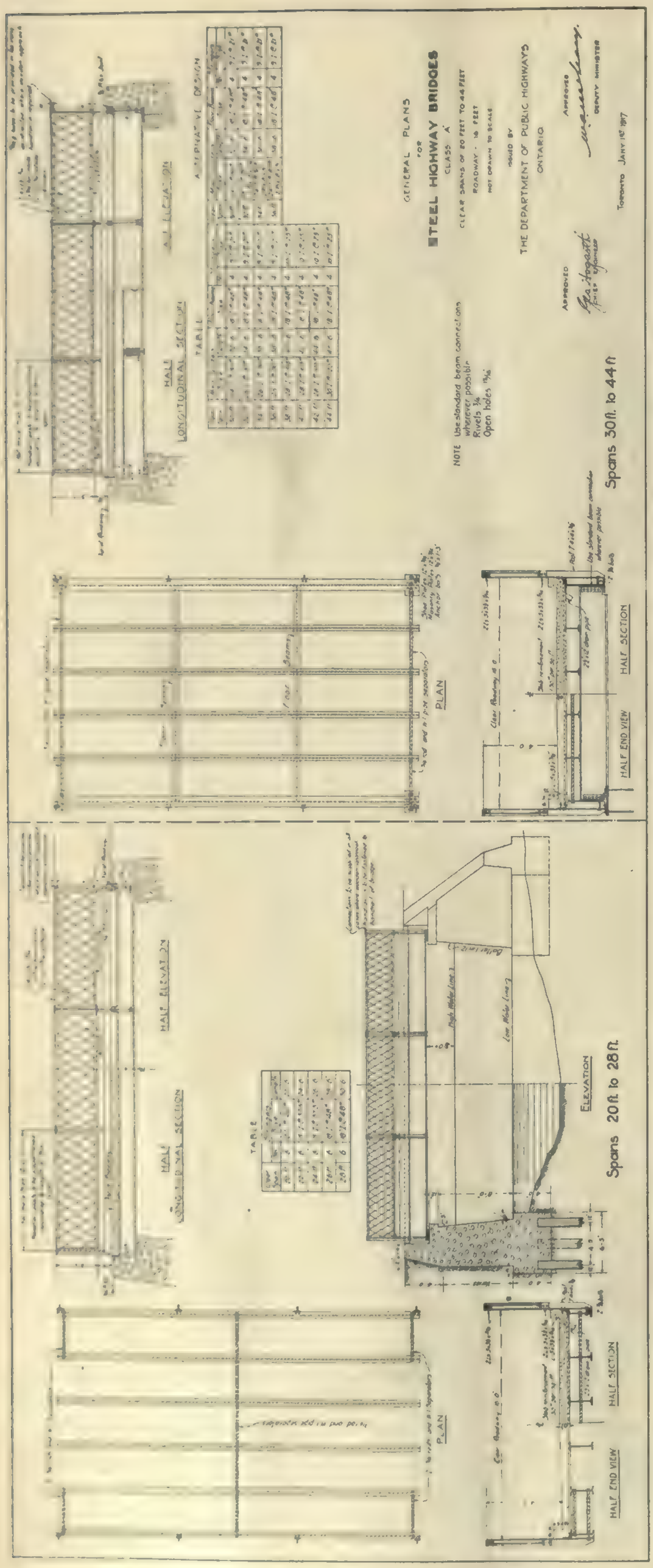
*From "Gravel Roads," Bulletin No. 2, Michigan State Highway Department.

†State Highway Commissioner of Michigan.

Road Activity in Jones County, Mississippi

The next two months will probably see the expenditure of $100,000 for highway improvement in Jones County, Mississippi, specifications for the work having been prepared by the County Board of Supervisors. An effort will be made to place the roads in good condition by fall in order to facilitate the movement of produce. As at present planned, the money will be used in Beats 1, 2, 3 and 5, in the following amounts: 1, $17,000; 2, $30,000; 3, $18,000; 5, $18,000.



PLANS FOR GIRDER BRIDGE—FROM THE STANDARDS OF THE ONTARIO DEPARTMENT OF PUBLIC HIGHWAYS.

Steel Bridge Standards of the Ontario Department of Public Highways*

By GEORGE HOGARTH†

The improvement of roads throughout the province has attracted a wide public interest for some years and the superior type of road now built has led to a demand for better types of culverts and bridges, with wide roadways and an appearance in keeping with the improved surroundings. Among county officials there has been an increased interest in the types of construction selected. There still remains, however, a lack of uniformity in general construction and an absence of proper appreciation of the many types of culverts which are suitable for the smaller waterways. It is, therefore, sought to present to those in charge of the highways a review of designs and methods of construction which will result in securing sound and enduring structures properly adapted to the requirements of traffic in designing culverts and bridges to be built on the highways of the Province of Ontario.

To properly design and erect such structures involves the exercise of good judgment and skill, which can be acquired only through actual training and experience in carrying on the work of construction. It is apparent, therefore, that the design and supervision of the construction of structures on the highways should be placed in the hands of engineers and superintendents thoroughly competent by experience to carry the work to a successful conclusion. Every structure presents features peculiar to its own location and no pamphlet or treatise, however detailed, can take the place of a competent engineer.

Steel Bridges

A number of designs for steel truss bridges having 16 and 18-ft. clear roadway and of various spans are included in a series of plans issued by the department. The types of bridge recommended are the pony Warren truss for spans of from 40 to 90 ft. and the through Pratt truss for the longer spans from 100 to 120 ft. These designs are prepared in accordance with the 1917 specifications for steel highway bridges, as issued by this department. All the bridges are designed to carry a dead load composed of the weight of the bridge, also a concrete floor 6½ in. in thickness in the center and 5½ in. in thickness at the sides, and a live load composed of a 15-ton road roller. End floor beams are recommended for all truss bridges. They stiffen the trusses considerably and the cost of such floor beams is very little, if any, in excess

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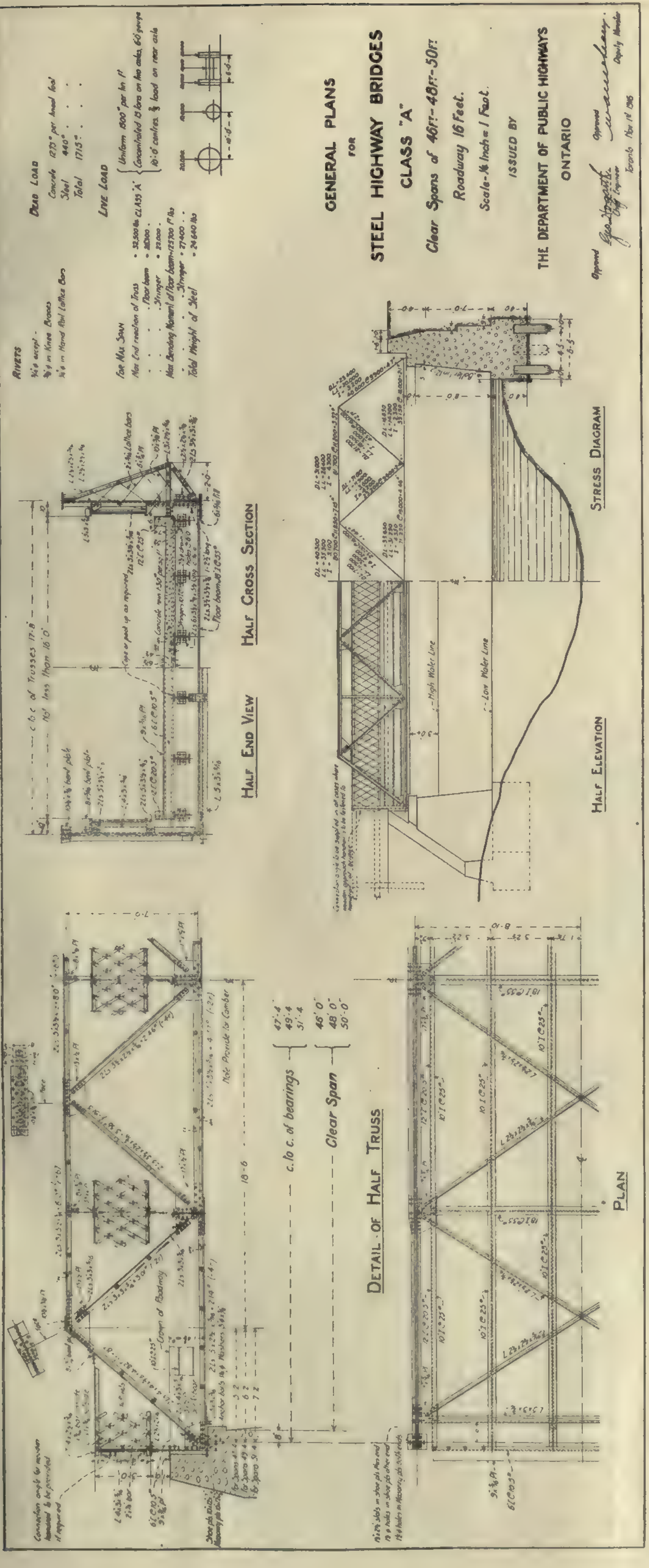
*From "Highway Bridges, 1917," an appendix to the annual report of the Department of Public Highways of Ontario, Canada.

†Chief Engineer, Ontario Department of Public Highways.



PLANS FOR PONY WARREN TRUSS—FROM THE STANDARDS OF THE ONTARIO DEPARTMENT OF PUBLIC HIGHWAYS.

of the cost of forms, labor and concrete for a joist wall. A detail consisting of a cover plate to prevent debris falling between the gusset plates, as shown in the series of plans, is also recommended. For T-chord bridges it is advisable to place a cover plate 5/16 in. thick on the end post to prevent the rapid rusting away of the steel which occurs sometimes at or about the floor level. Stringers are attached to floor beams by means of lug angles, as such a connection provides a rigid and strong detail, adding very little to the cost of the bridge. The use of such a detail is fully justified by experience.

Drainage of Concrete Floors

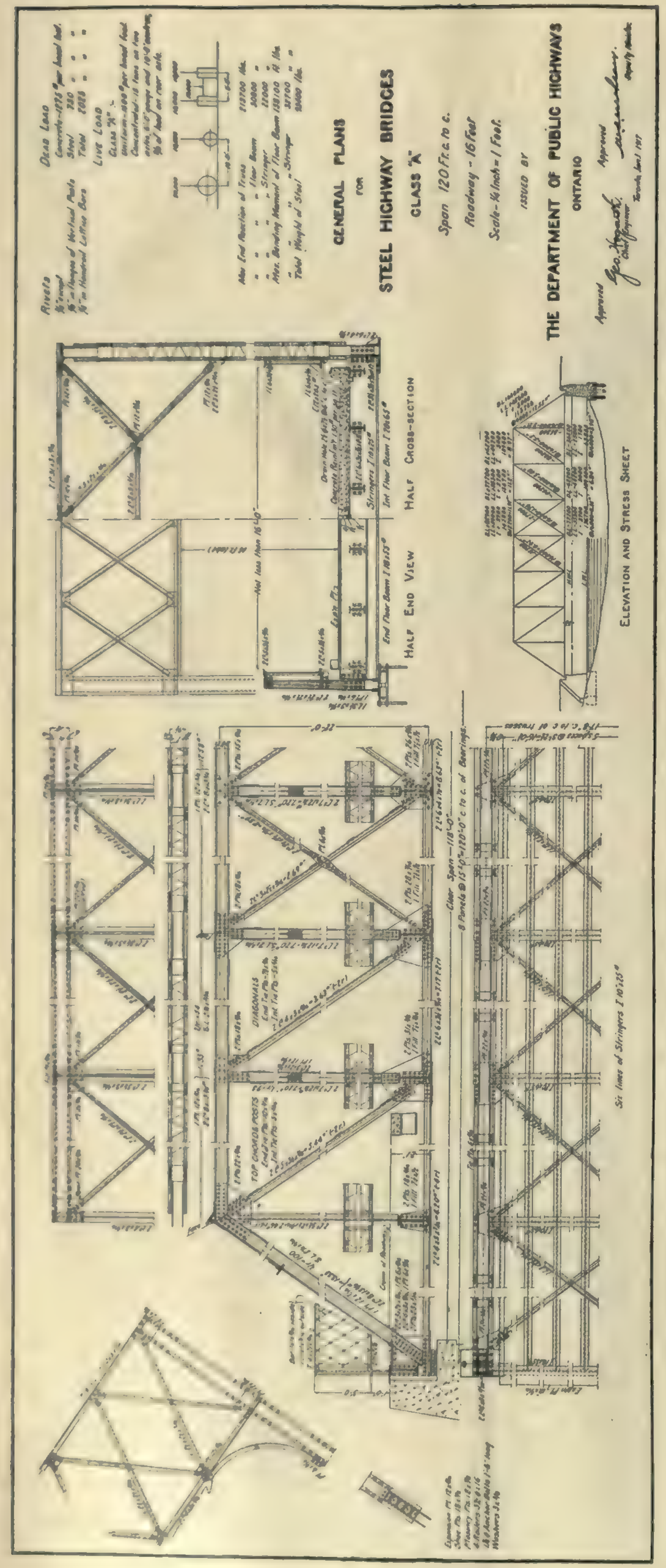
Concrete floors of bridges should have drainage holes along the curb so as to allow water to quickly leave the surface. A satisfactory size of drain is 2½ in. inside diameter and the drain pipe should extend about 1½ in. below the under side of the concrete floor to prevent the water running back along the concrete. The pipes should discharge clear of any other portion of the bridge. On account of slight inequalities in the concrete floor it is advisable to locate the drains fairly close together to prevent pools of water lying on the floor. For this reason the pipes, which are inexpensive and consist of pieces of 2½-in. iron pipe or tile, should be located every 6 to 10 ft. along the curb.

Painting Steel Highway Bridges

When a steel bridge is first erected it should be cleaned of all rust, scale and dirt and given two coats of good paint well brushed in. A sufficient length of time should be allowed between each coat to permit the paint to dry thoroughly. All painting should be carried out during dry weather and according to the departmental specifications. The first painting, if well done, should last from four to six or seven years, at the end of which time repainting will be necessary. The longer repainting is delayed the worse the condition of the steel becomes, so that it is advisable and economical to repaint the structures at least every four or five years. Prior to repainting, the steel should be thoroughly cleaned with steel scrapers, chisels and wire brushes, so that all rust and scale is removed and the bare surface of the steel is exposed. The proper time to repaint a bridge is during the warm dry months of the year, when the painting can be done under the best possible conditions. A steel bridge which is properly cleaned and painted every four or five years will have its working life greatly lengthened, so that cleaning and repainting is actually an economy.

Periodical Examination

It is advisable that the county or township road superintendent should periodically, at least twice a year, examine all parts of each steel bridge under his care. The inspection should cover every portion of the structure from the foundations of the



PLANS FOR THROUGH PRATT TRUSS—FROM THE STANDARDS OF THE ONTARIO DEPARTMENT OF PUBLIC HIGH WAYS.

abutments to the top of the bridge and should be made with a view to discovering any dangerous condition which may have developed. Broken members especially should be looked for, the condition of the paint, the strength of the hand-rail or guard rail, and the general line of the chords of the bridge examined to see if there is any twisting or deflection. Any members of the truss which are adjustable should be tightened to take stress, and the lateral bracing examined to see that it is straight and tight. Connections between stringers and floor beam and floor beam and truss should also be examined to discover defects, and the practical test of observing the bridge during the passage of a heavy load should always be observed. Any member of the bridge which is seriously crippled by passing vehicles colliding with it should be entirely removed and renewed, as the strength of damaged steel is open to serious question. The danger to structures from fire should be carefully considered and any brush or driftwood which has collected around the bridge should be gathered up and removed to a safe distance.

Inspection of Steel Bridges During Erection

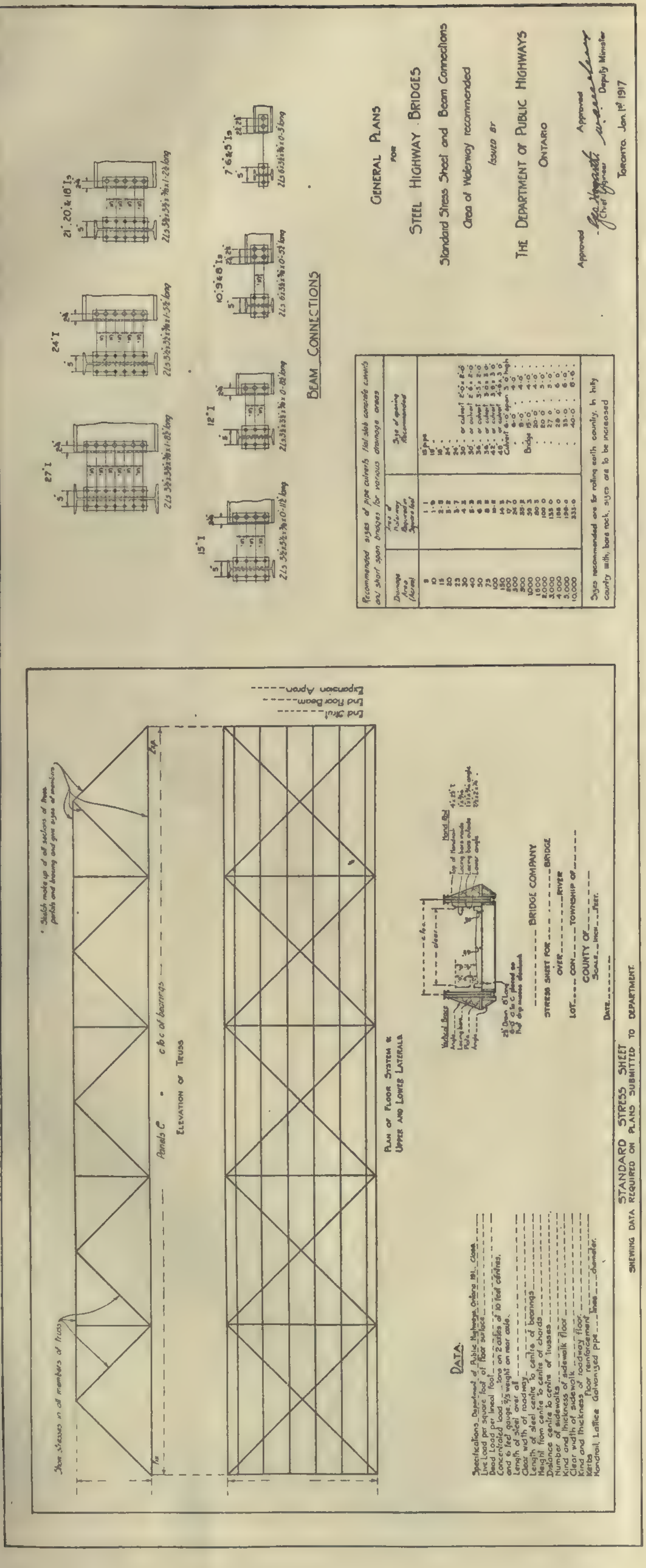
The inspector appointed by the council should be furnished with a copy of the plans and specifications to which the bridge is built, and he should carefully study the details of the work as set forth. Upon commencing the work of erection he should first assure himself that the false work is secure and that any erection equipment provided by the contractor is adequate. During the work of erection the inspector should be constantly on hand and note any damage to the metal, failure to conform to the specifications, or any special difficulty in assembling. He should prevent any abuse or rough usage of the material such as bending or heavy pounding with sledges.

All fillers, washers and threaded members should be watched to see that they are not omitted or misused.

Before riveting commences make sure that all parts of the structure are properly aligned and that the required camber exists.

The heating of the rivets should be carefully observed and any underheating or burning prevented. Field rivets when driven should be examined and any that are loose or have misformed or offset heads should be cut out and replaced. Shop rivets may also be loosened by erection stresses and any that are discovered should be cut out and redriven. Any rivets marked to be cut out should be removed in such manner as not to injure the surrounding metal. The inspector should also keep a record of any injuries or accidents occurring during the work.

Upon the completion of the structure the inspector should submit a written report to



STANDARD STRESS SHEET AND BEAM CONNECTION DETAILS—ONTARIO DEPARTMENT OF PUBLIC HIGHWAYS.

the municipality showing exactly the work carried out under his supervision.

Plans for Approval of Department

Under Section 459 of the Municipal Act, authority is given the department to approve plans of iron, steel, concrete or stone bridges exceeding 20 ft. in clear span and constructed by the corporation of a county or township.

Duplicate blue-prints of all plans and specifications for such structures should be submitted to the department. In order to facilitate the passing of such plans it is advisable that the following information be shown on the drawings:

On a Stress Sheet for Steel Bridge.—This plan is usually submitted by the bridge company and should show a line diagram of elevation of truss with all stresses and the make-up of all members, a plan of lower laterals and floor system, a plan of upper laterals, a half section and half end view of truss showing make-up of handrail and portals, the location of floor beams and stringers, thickness and reinforcement of concrete floor, the make-up of curbs, expansion apron and end strut or end floor beam, the drainage of floor and the make-up of vertical braces (if any). The data required on the plan comprise a statement of the following: The specifications to which the bridge is built, live load per square foot of floor surface, dead load per lineal foot of bridge, concentrated live load, length of the bridge over all, length of the bridge center to center of bearings, clear width of the roadway, height from center to center of chords, distance center to center of trusses, number of sidewalks, kind and thickness of sidewalk floor, clear width of sidewalk, kind and thickness of roadway floor, kind and size of curbs, size of floor reinforcement and kind of handrail. It is important that the title give the name of the bridge, name of the creek or river, and the lot, concession, township and county, the scale of the plan, the name of the bridge company submitting the drawing, and the date.

On a Detail Shop Drawing for Steel Bridge.—This plan is usually prepared by a bridge company and should show all essential data pertaining to the size of rivets, fabrication dimensions and painting of the steel.

On a General Plan of Steel Superstructure and Substructure.—All essential dimensions and elevations should be given regarding low water level, high water level, depth of the river, nature of the bottom, class of material in the foundation, an elevation of abutment, a section of abutment, a plan of abutment, a plan of pile foundations (if any), and an end view of wing wall. Where steel spans are to be used an outline elevation is required. The title should give all essential data given in the title of the stress sheet for steel bridges, together with the name of the engineer submitting the plans. The plans should also show if there is any likelihood of the stream bed scouring and a recommended method of preventing undermining of the foundations. Titles on all plans should preferably be located in the lower right-hand corner of the sheet.

Uniform Specifications for Missouri Roads

The county highway engineers and road overseers in Missouri will be furnished with typical plans and specifications for the construction of earth, rock, gravel and other types of road. State Highway Engineer Alexander Graham, in a recent statement, referred to the "vast amount of grading being done along impractical lines." He said that road overseers follow different methods and disparaged the scraping of sod and weeds into the center of earth roads, as it made the road "spongy" and required an immense amount of traffic to compact the earth so that it would shed water and remain firm.

Experimental Road Building in Wisconsin

The Wisconsin State Highway Commission will conduct a number of experiments with materials for road building looking toward the construction and maintenance of 5,000 mi. of trunk highways in the state, according to a recent report.

Reinforcement for concrete roads will be tried in Milwaukee County. An experiment on the sand roads of Columbia County will consist of placing a carpet of straw or grass upon the road, and using a binder of road oil and asphaltum. Stone of varying sizes used with different binders will be tried on the macadam roads between Baraboo, in Sauk County, and Kilbourne.

Maine Highway Contracts

Contracts in force for highway work in Maine amount to $356,000. The roads, with their lengths, the names of the contractors, and the amounts of the contracts are as follows:

Highway	Section	Length Miles	Contractor	Amount
C	Brunswick	4.59	(C. R. McCormick, Supt.)	$30,000
D	Nobleboro	2.67	A. Williams & Co.	19,470
D	New Castle	2.85	John Arborio	25,602
D	Edgecomb	1.06	H. A. Day	8,296
D	Thomaston	3.00	(John S. Gardner, Supt.)	15,000
E	Greene	2.00	(E. L. Ford, Supt.)	8,000
F	Sandy River	3.00	(B. W. Radcliffe, Supt.)	15,000
G	Waterville	1.84	James H. Kerr	16,782
G	Oakland	1.38	Small & Ingalls	22,083
I	Pittsfield	6.16	Dominic Susi	49,484
K	Blaine	2.50	(Selden D. Rice, Supt.)	20,000
M	Ellsworth	4.00	(H. C. Schoppe, Supt.)	20,000
N	Edmunds	1.46	A. Williams & Co.	15,649
O	Bowdoinham No. 1	6.05	A. D. Bridges' Sons	90,787

Tex-O-Kan Highway Route Selected

The route of the Tex-O-Kan Highway, for the promotion of which delegates from a number of counties in Texas and Oklahoma recently organized at Abilene, Texas, begins at Corpus Cristi, Texas, and passes through the county seats of the counties, extending northwesterly through San Antonio to Kerrville in Kerr County, thence northerly to Quanah, in Hardeman County, thence to Altus and Taloga, Okla., to Dodge City, Kan. It crosses the Atlantic-Gulf Highway at San Antonio and other highways at various points, and at Dodge City connects with the Santa Fe Trail.

The following specifications for the highway have been adopted:

Width, right of way, not less than 60 ft.; grade, ditch to ditch, 32 ft.; cuts, at bottom, ditch to ditch, 24 ft.; fills, at top of grade, 24 ft.

Crown, 8 to 10 in.

Grade, not over 5%, all grades to be above high water; sufficient drainage to take care of storm water.

Type of construction, clay and sand or gravel with clay binder.

All culverts are to be of concrete, 24 ft. long across the roadbed, and all bridges are to be at least 16 ft. wide, inside measurement.

Bond Issues in Missouri

Seven counties south of the Missouri River, which traverses the central part of the state, have voted bonds for the improvement of highways and bridges, three of the counties having passed bond issues within the past few weeks. These are Mississippi County, $375,000; Scott County, $750,000, and New Madrid County, $800,000. The expenditure of $1,925,000 in addition to state and federal funds, it is stated, will completely change the condition of the roads in the southeastern part of the state where the three counties are situated.

Clay County in the northwestern part of the state passed an issue of $1,250,000 which was upheld by the Supreme Court of the state. The money will be used on important highway work.

Cooperative Buying of Road and Bridge Materials

A new plan for reducing the cost of materials used in highway improvement is under consideration by highway officials in Iowa. The plan, which originated with Chief Engineer T. H. MacDonald, of the Iowa State Highway Commission, is to have a committee of the county supervisors' association ascertain the most available sources of material and supplies, and secure the lowest estimates on large quantities for 1918 work. These estimates would be submitted to the board of each county. It is believed that the plan would facilitate the delivery of material for the smaller contracts which may be delayed on account of larger orders, and that it would save the counties thousands of dollars.

Inter-County Highway Map of Ohio

A map showing the progress of state and local road work on the inter-county highways outside of incorporated cities and villages, in Ohio, has been issued by the State Highway Department. It is 22 x 34 in. in size and is printed in black and red, red being used to indicate the location and condition of different classes of improved roads. The names of the inter-county highways are given in a list printed at the top of the map in numerical order, the corresponding numbers appearing on the map proper, and the inter-county roads that have been designated as main market routes being indicated by Roman numerals. The main market routes are shown by parallel heavy and light black lines, the cities and important villages on the routes being given in a list at the bottom of the map. It also contains a reprint of the state traffic laws that became effective June 28, 1917.

The price of the map is 8 ct. if obtained at the office of the State Highway Commissioner, Columbus, or 10 ct. if ordered by mail.

Bids for Lincoln Highway Improvement in New Castle County, Delaware

Bids for improvement work on the Lincoln Highway in New Castle County, Delaware, were received by the Levy Court on Aug. 14 and referred to the committee of the whole, the state and the county engineers, as follows:

State Line to Newark: J. C. Bentley, concrete wearing surface, $75,882.00; Gibbons & Buckley, vitrified brick, $95,105.35; concrete, $74,069.25; Northern Construction Co., Warrenite, $92,483.25; Highway Improvement & Repair Co., Warrenite, $93,867.75; Standard Bitulithic Co., Warrenite, $91,105.00; Manwaring & Cummins, vitrified brick, $125,682.50; Amiesite, $94,590.00, and concrete, $77,214.50.

Wilmington to Marshallton: Northern Construction Co., Warrenite wearing surface, $142,125.01; Highway Improvement & Repair Co., Warrenite, $141,423.60; Standard Bitulithic Co., Warrenite, $138,912.78; Manwaring & Cummins, Amiesite, $156,728.29; concrete, $123,599.77, and brick, $209,410.24.

GOOD ROADS

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Number 8

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

AUGUST 25, 1917

KEEP POLITICS OUT

There has never been the slightest justification for politics in road building and there has never been an instance of the injection of political considerations into the road affairs of a community that did not work injury to that community.

At this particular time, when all the energies of the nation should be concentrated on the things that will bring the war to an early end by the victory of the Allies—among which building roads in this country is of vital importance—political meddling in honest efforts to better American road conditions is no less than criminal.

These obvious facts are given point by the forced resignation of State Highway Commissioner Black of Pennsylvania. Just where the fault lies in that case is immaterial to the general proposition; it is apparently beyond question that politics were at the bottom of it. The highway work of a state with the area and population of Pennsylvania requires the services of a small army of men, and that means almost unlimited opportunity for patronage and the bestowing of favors and special privileges in exchange for political support. In other words, it makes possible—indeed, very easy—the building up of a powerful political machine, a circumstance that has naturally caused the professional politicians to cast longing eyes at the highway department of more than one state. It is to the credit of the men who have carried on America's road building that their work has been done as well as it has been done, under the handicaps they have frequently had imposed upon them.

Just now the great task facing the United States is the winning of the war. This undertaking involves not only military and naval operations, but also the less spectacular but very necessary work to be done by civilians. The latter includes the extraordinary work of furnishing munitions, food and other supplies, and the maintenance of the ordinary industrial and commercial life of the nation at as nearly a normal status as the exigencies of war permit.

The part that roads will play in all this work has already been pointed out in these columns. We must continue to build and maintain roads—not as we have built and maintained them in the past, but as we have never built and maintained them before. The country needs roads for carrying the traffic they have always carried and it needs them for the traffic to which they will be subjected by the demands of war. The railroads were overburdened before we entered the war and their over-load will increase; it has already been predicted that there will be a serious shortage of rolling stock and a lack of terminal facilities for taking care of crop movements in the fall. The use of motor trucks to take care of a part of the hauling that would naturally be done by rail commenced months ago and has increased to very considerable proportions. It is growing all the time and promises to continue to grow.

All this means that we must have more roads and better roads, that we must accelerate road building programs.

It means that ways must be found to finance and to prosecute the work. Current revenues must be used, and used to the best advantage, to defray the cost of maintenance and of the shorter-lived parts of the work. Bonds must be issued to meet the cost of such portions of the work as have durability commensurate with the life of the bonds.

It means that in order to meet increasing labor costs, those actually performing road work must make the fullest use of machinery, must be quick to take advantage of every labor saving device or method available.

It means that those in responsible charge of highway work —the men at the top—must organize their subordinates into efficient forces in which team work will take the place of individual effort.

And it means that every road builder must put into his work the best that he has.

It should be evident to anyone capable of realizing the existing crisis that the present is no time to tamper with the administrative machinery of road building for political or other selfish purposes. Such interference is particularly reprehensible in a state where are situated industries vital to the country's prosperity in peace and its success in war.

STEEL BRIDGE STANDARDS

Not so many years ago the strength of the bridges on country roads was of relatively little importance. Traffic was light and individual heavy loads rare. The design of steel bridges received scant attention from road officials and the erection of the structures even less.

The pleasure car and the motor truck have changed conditions. At present the utility of a road depends in a large measure upon the strength of its bridges. The old haphazard methods of providing bridge structures are fast being superseded by better ones. Ready-made, "tin" bridges are less commonly sold by bridge companies, and the designing of highway bridges is more and more being done by competent engineers working in the interest of the purchaser and not the seller. As a result, adequate structures are replacing the unsightly, weak bridges once so common throughout the rural districts.

One factor that has entered largely into the improved conditions of recent years is the work that has been done by central highway authorities in aiding the smaller units in their bridge work. Part of what has been done in the Province of Ontario is described elsewhere in this issue and is illustrated by reproductions of typical drawings from the standards of the provincial highway department. Similar work has been done by many of the state highway departments on this side of the border, as has been noted from time to time.

Comparatively little of the total road mileage is made up of bridges, but from the standpoint of the utility of the highways the bridges are of very great importance. Good roads necessarily include good bridges.

Apparent Specific Gravity of Non-Homogeneous Fine Aggregates[*]

By A. S. REA[†]

The specific gravity or relative weight of such materials as rock, slag, gravel, sand, and similar materials used in road and building construction is generally considered of sufficient importance to justify the inclusion of this determination in the routine tests of such aggregates.

The specific gravity of such materials may be expressed as the "true specific gravity" or as the "apparent specific gravity." The first of these is applied to the specific gravity of the substance of which the mass is composed, while the second is applied to the specific gravity of the mass including the air spaces or voids.

From the standpoint of their use as aggregates the apparent specific gravity determination of such materials is the more important, for the reason that the true specific gravity determination will not in general give any indication of the value or suitability of such materials for construction purposes.

Until about four years ago one of the most common methods of determining the specific gravity of such materials as rock was the so-called displacement method by which the specimen is first weighed in air, then in water and from these results the specific gravity calculated. It was found, however, that this method was not accurate for porous materials due to the fact that no provision was made for the absorption of water by the specimens while the determination was being made. At the present time there are a number of methods in use by which the apparent specific gravity of rock and similar materials many be satisfactorily determined. Practically all of these methods make provision for the porosity of the material by immersing the specimens in water until no more water is taken up, after which the specimens are surface dried and the volume determined by some displacement method.

It is evident that such a method is not practical for fine aggregates, such as sand, for the reason that it involves, after the immersion of the specimens in water, the subsequent wiping of the surfaces of the individual pieces to remove excess of water. This of course cannot be done satisfactorily for a large number of small grains below a quarter of an inch in size.

It is likewise evident that if the sand contains an appreciable percentage of relatively porous grains, such as sandstone, shale, or limestone fragmants, it will not be possible to obtain an accurate determination of the apparent specific gravity of the material by the usual displacement method used for such materials in which the volume is determined by the displacement of water or other liquid in some form of specific gravity flask or graduated cylinder.

Recognizing the desirabality of having a method of determining the apparent specific gravity of non-homogeneous fine aggregates in such a manner that the porosity of the grains would be provided for, led the writer to make some investigations and experiments with this object in view. The experiments conducted covered a considerable number of different methods of procedures which it is unnecessary for the purpose of this paper to describe or discuss. The method which was the most satisfactory from the standpoint of both accuracy and convenience and has been adopted in the testing laboratory of the Ohio State Highway Department as a standard test is described as follows:

Method of Determining the Apparent Specific Gravity of Fine Aggregates.—Five hundred grams of the thoroughly dried sample are placed in a 500-cc. graduated cylinder provided with a glass stopper. Approximately 20 cc. of kerosene or a sufficient quantity to saturate the grains and allow for a slight excess is then poured into the cylinder. The stopper is inserted and the cylinder is vigorously shaken until all of the sand grains appear to be coated with kerosene. A measured quantity of water, usually 250 cc., is then introduced into the cylinder. The cylinder is then thoroughly shaken to bring the excess of kerosene to the surface of the water. The two liquids, kerosene and water, being non-miscible and of different specific gravity, a clean line of demarcation will form between them and the reading of the volume of water can be readily obtained. From the dry weight of the aggregate and the volume of the liquid displaced, the "apparent" specific gravity of the aggregate can be calculated.

In this method the grains of sand retain the kerosene in their pores by capillary attraction, so that in displacement the volume is not that of the substance composing the grains, but the volume of the grains themselves. Any excess of kerosene beyond that necessary to fill the pores rises to the surface of the water.

RESULTS OF SPECIFIC GRAVITY DETERMINATIONS.

Sample.	By Usual Displacement Method.	By Method Described.	Variation.
Standard Ottawa sand	2.65	2.65	0.00
Limestone screenings	2.63	2.55	0.08
Sandstone	2.47	2.41	0.06
Sand G-1312	2.63	2.52	0.11
" "-1319	2.60	2.50	0.10
" "-1320	2.59	2.46	0.12
" "-1321	2.63	2.50	0.13
" "-1325	2.60	2.58	0.02
" "-1328	2.57	2.54	0.03
" "-1329	2.63	2.62	0.01
" "-1331	2.72	2.66	0.06
" "-1333	2.63	2.60	0.03
" "-1336	2.65	2.63	0.02
" "-1344	2.58	2.48	0.05

In order to determine whether an appreciable film of kerosene adheres to the surface of the grains, which would thus result in an increased volume of liquid displaced with a consequent lowering of the specific gravity, determinations by this method were made on standard Ottawa sand. This sand is composed of practically pure quartz grains, hence its absorption need not be considered. The results showed this film to be so slight as not to appreciably affect the results.

To determine on the other hand whether the grains will completely retain the kerosene in the cavities or pores during the process of shaking the sand in water, a series of determinations was made on samples of crushed stone and slag of predetermined specific gravity. The results here showed that except in cases where the aggregate contained unusually large cavities or pores, as in some very porous slags, this method was entirely satisfactory.

In making the specific gravity determination by this method, it is essential for accurate results that the aggregate be clean. If the sand contains an appreciable percentage of silt it should be washed, otherwise the silt will be held in suspension in the kerosene at the top of the water, thus introducing a slight error as well as making the reading more difficult. In order to show the difference in the results obtained by this method as compared to the old displacement method, the results obtained in one series of tests are given in the table.

From the figures given in the table it will be noted that the difference in the specific gravity by the two methods ranges from zero with the Ottawa quartz sand which has a negligible absorption, to 0.13 in the case of sand G-1321, which is a very coarse-grained sand consisting almost entirely of rounded sandstone fragments. Between these limits the specific gravities of the sands show variations depending upon the extent of the porous grains present in the sand.

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[*] Paper presented at the 20th annual meeting of the American Society for Testing Materials, Atlantic City, N. J., June 26-29, 1917.

[†] Testing Engineer, Ohio State Highway Department.

Sidewalk Construction in Pawtucket, Rhode Island

The Board of Aldermen of Pawtucket, R. I., recently adopted new rules for the construction, repair and maintenance of sidewalks which conform to the 1917 law giving the city the power to make improvements and to assess the owners of abutting property for 50% of the expense. The Board of Street, Water and Sewer Commissioners has authority to specify the grades and lines to be followed, the material to be used, the manner in which the work shall be done and by whom.

The rules provide that all applications for sidewalk construction must be made at the office of the City Engineer. Granolithic walks are specified for all streets requiring complete reconstruction, one-half the cost to be paid by the city, and the other half by the abutting property owner or owners. The walk must be laid the full width from curb to street line, and this rule also applies to brick, cement, tar, concrete walks and stone flagging, unless special permission has been given by the commissioners, in which case the owner is required to lay and maintain the full width of the sidewalk at his own expense. The work must be done in accordance with the requirements of the commissioners, and under agreement to protect the city in the event of defective construction.

Property owners are required to pay for all repairs or alterations made by the commissioners or under their direction, except such repairs upon granolithic walks as are made necessary through defective work.

Sidewalks must be laid when the frost is out of the ground. The rules expressly specify that no cement walks may be laid in freezing weather.

Route of the Pikes Peak Ocean to Ocean Highway

The final link in the route of the Pikes Peak Ocean to Ocean Highway from the Atlantic to the Pacific Coast was decided upon at a conference of officials of the Pikes Peak Ocean to Ocean Highway Association at San Francisco on July 30, the Feather River-Sacramento Causeway route being selected as the western extension of the highway with termini at San Francisco and Oakland, Cal.

The Atlantic termini are New York and Philadelphia, the New York section passing through Newark and Morristown, N. J., and Easton and Allentown, Pa., joining the Philadelphia section at Reading, Pa. From Reading the highway follows the route of the William Penn Highway through Harrisburg, Tyrone and Altoona, to Pittsburgh. The route from Pittsburgh westward passes through the following cities and states: Steubenville, Coshocton, Newark, Columbus, Springfield and Dayton, Ohio; Richmond, Indianapolis and Rockville, Ind.; Decatur, Springfield, Jacksonville and Griggsville, Ill.; Hannibal, Macon, Chillicothe and St. Joseph, Mo.; Hiawatha, Belleville, Norton, Colby and Goodland, Kan.; Burlington, Limon, Colorado Springs, Manitou, Hartsel, Buena Vista, Leadville, Glenwood, Rifle and Meeker, Colo.; Vernal, Duchesne, Heber City, Park City, Salt Lake City, Ogden, Brigham and Lucin, Utah; Overland Trail through Elko, Winnemucca, Lovelock and Reno, Nev.; Portola, Quincy, Oroville, Marysville, Sacramento, Davis, Bonicia, Martinez, Berkeley, Oakland and San Francisco, Cal.

The selection of the western extension of the highway was the result of an official inspection tour, which indicated that less than 10% of the 1,600 mi. between Colorado Springs and San Francisco was in poor condition. According to reports of the association, the road follows streams, passes through inhabited territory with a minimum mileage through desert or desolate country, and traverses many sections of unusual scenic interest. The average running time was 19 mi. an hour.

The work of marking the highway is progressing as rapidly as possible. The signs consist of red and white bands, each 10 in. wide, at cross roads, forks, and at frequent intervals. These are painted on telephone poles, fence posts, trees or rocks. In addition, 1,500 enameled steel signs, 14x20 in. in size, in red and white, are to be placed on individual posts at intervals of not more than 5 mi., between New York and San Francisco.

Market Roads in Indiana

The main market roads of Indiana, as provided for by the new law, are to comprise 2,000 mi. The State Highway Commission is authorized to lay out this system and to aid in the construction of the highways to the extent of 50% of the cost. Routes totaling 800 mi. have now been selected, Indianapolis being the central point from which the main cardinal highways radiate. The north to south main highway will begin at South Bend and extend through Plymouth, Rochester, Kokomo, Tipton, Noblesville, Indianapolis, Columbus, Seymour, Scottburg, New Albany, and Jeffersonville.

The Lincoln Highway will provide practically the route of the east and west road through the northern part of the state; through the central part it will follow the old National Road from Richmond to Terre Haute by way of Indianapolis, and through the southern part of Indiana the road will start at Lawrenceburg and extend through Versailles, North Vernon, and Seymour to Bedford.

NEWS NOTES

It is estimated that the Counties of Georgia spend about $8,000 a day for highway construction and maintenance, according to a recent statement.

The Road Bond Election in Scott County, Missouri, resulted in a vote in favor of a bond issue of $750,000 for the improvement of about 230 mi. of road.

Receipts from Motor Vehicle Licenses in Pennsylvania from Jan. 1 to July 1, 1917, amounted to $2,913,837, an increase over the same period of 1916 of $876,475.

Oiling Without Stone Chips is a problem with which the Maryland State Roads Commission is said to be contending, due to the difficulty of securing deliveries of the stone.

The First of the Federal Aid Projects in Minnesota will be under construction within a few weeks, according to a report. This is a highway in Chisago County which it is expected will cost $110,000.

"**When a Railroad Begins Using Heavier Engines and Cars,** it lays heavier rails to withstand the increased strain; the same principle should be applied to highways," said J. F. Witt, County Engineer of Dallas County, Texas, at a weekly meeting of the Rotary Club. "We would not think of having gravel roads in our downtown streets because the traffic is too heavy. It is also heavy in the country, and the road is put under a greater strain, because in town the vehicles pass over all parts of the road surface, while in the country they always follow the ruts."

The Portland Cement Industry during the first six months of 1917 showed a considerable increase in production and shipments over the corresponding period of 1916, the demand being reputed to come from small consumers, with the usual amount going into roads and pavements. In July, the U. S. Geological Survey, Department of the Interior, reported the prices higher than they had been for 19 years, greatly influenced by the war, whereas the demand for cement had not been much affected by it. The month of June showed a slight falling off in certain districts, attributable, in part, it is said, to the entrance of the United States into the war, the prospect of increased taxation, and the purchase of Liberty bonds.

MEETINGS

Calendar of Coming Meetings

August 27-29.—Union of Canadian Municipalities.—Annual convention, London, Ont. Secretary, W. D. Lighthall, K.C., Westmount, P. Q.

Aug. 29-31.—Ontario Municipal Association.—Annual convention, Toronto, Ont. Secretary, B. H. Spence, 705 Lumsden Building, Toronto, Ont.

Sept. 5-8.—League of American Municipalities.—Annual convention, Gary, Ind. Secretary, Robert E. Lee, City Hall, Baltimore, Md.

Sept. 11-13.—American Association of Park Superintendents.—Annual convention, St. Louis, Mo. Secretary, Roland W. Cotterill, 533 City Hall, Seattle, Wash

Sept. 18-20.—League of Iowa Municipalities.—Annual convention, Iowa City, Ia. Secretary, Frank G. Pierce, Marshalltown, Ia.

Sept 18-20.—League of Virginia Municipalities.—Annual convention, Lynchburg, Va. Secretary, L. C. Brinson, Portsmouth, Va.

Sept. 24-29.—League of California Municipalities.—Annual convention, Santa Rosa, Cal. Secretary, Wm. J. Locke, Pacific Building, San Francisco, Cal.

Oct. 9-12.—League of Kansas Municipalities.—Annual convention, Wichita, Kan. Secretary C. H. Talbot, University of Kansas, Lawrence, Kan.

Oct. 17-18.—League of Minnesota Municipalities.—Fifth annual convention, St. Cloud, Minn. Secretary-Treasurer, Richard R. Price, University of Minnesota, Minneapolis.

Nov. 19-24.—City Managers' Association.—Annual meeting, Detroit, Mich. Secretary, W. L. Miller, City Manager, St. Augustine, Fla.

Nov. 21-24.—National Municipal League.—Twenty-third annual meeting, Hotel Statler, Detroit, Mich. Secretary, Clinton R. Woodruff, 703 North American Building, Philadelphia, Pa.

Jan. 15-17, 1918.—Virginia Good Roads Association.—Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

American Association of Park Superintendents

A large attendance is expected at the nineteenth annual convention of the American Association of Park Superintendents, at St. Louis, Mo., Sept. 11, 12 and 13, on account of the central location of the city and the fact that it has one of the most comprehensive recreation systems in the country. The convention will be held at the Planters Hotel, which will also be the headquarters of the delegates.

The business sessions will occupy the mornings of the 3-day convention, and one evening, and will consist of the usual reports, addresses, papers and discussions. The afternoons will be devoted to inspection tours about the city. The first afternoon will include a visit to the East St. Louis Park System, Indian Mounds, proposed State Park; the second afternoon, the City Nurseries, Chain of Rocks, Riverside Club, North St. Louis Parks, Forest Park, Missouri Botanical Garden; third afternoon, South Side parks and trip to Grants Farm.

A reception and dance will be given members and visitors by the St. Louis Park Department Association on the evening of Thursday, Sept. 13.

The officers of the association are: President, John F. Walsh, Jr., New York, N. Y.; Secretary-Treasurer, Roland W. Cotterill, 533 City Hall, Seattle, Wash.

Virginia Good Roads Association

Announcement is made of the seventh annual convention of the Virginia Good Roads Association to be held at Richmond, Va., on Jan. 15, 16 and 17, 1918. The Secretary of the association is C. B. Scott, of Richmond, who is Assistant State Highway Commissioner of Virginia.

League of Wisconsin Municipalities

The annual convention of the League of Wisconsin Municipalities, which was announced for Aug. 15 to 17, has been postponed until the last week of September, according to advices received from Ford H. MacGregor, Secretary of the league, Madison, Wis. The program has been modified, and it is expected that Ex-President Roosevelt will address the convention.

Tex-O-Kan Highway Organization

A permanent organization for the development of the proposed Tex-O-Kan Highway in Texas was formed recently at Abilene, Tex., by delegates from the various counties traversed by the route of the proposed highway. Specifications for the road were adopted and certain portions of the route selected. J. A. Walker, of Altus, Okla, was elected President; J. W. Golston, of Quanah, Tex., Secretary, and R. F. Hughes, of Quannah, Treasurer. A vice president was chosen for each county on the route of the highway.

Burlington Way Good Roads Association

A readjustment of divisions of the route of the Burlington Way from the Great Lakes to the Gulf of Mexico was recommended by delegates to the sixth annual convention of the association, which is promoting the permanent establishment of this highway. This action was the result of indifference on the part of certain municipalities formerly included in the route. The convention was held at Springfield, Ill., on Monday of last week. Carl Weber was reelected president. The 1918 convention will be held at Rock Island, Ill., on August 14.

PERSONAL NOTES

H. H. Bartlett has been made Office Engineer in the office of the City Engineer at Highland Park, Mich., having resigned as Maintenance Superintendent of the Eastern Washtenaw Good Roads District.

D. Q. McComb, formerly connected with the Bureau of Public Works, Philippine Islands, in charge of highway and bridge construction, and at present with the Pittsburgh Testing Laboratory, has been made captain in the Officers' Reserve Corps.

Prof. Milo F. Ketchum, Dean of the College of Engineering University of Colorado, has been elected President of the Society for the Promotion of Engineering Education. For two years Prof. Ketchum was connected with the University of Illinois, and later became the contracting manager of the American Bridge Co., at Kansas City, Mo.

EQUIPMENT — TRADE — MATERIALS

New Heating Distributor

A new distributor for the application of the various bituminous materials used in road work has recently been put on the market.

The machine, which is shown in the accompanying illustration, consists of a tank, with heating and distributing attachments, mounted on a motor truck chassis. The tank has a capacity of 600 gal. and is 42x86 in. in size. It is equipped with fourteen 2½-in. heating flues and two special kerosene oil burners placed beneath the tank near the center. The kerosene is atomized by air pressure maintained by a small hand-operated air pump connected with the fuel tank. The pressure in the fuel tank which has a capacity of 20 gal., is shown on a pressure gauge placed in view of the operator and should be maintained at 50 lb. per sq. in. The burners are capable of heating 500 gal. of material to a temperature of 275° F. in 1½ hours.

The distributing mechanism consists of a series of pipes, a distributing manifold and a No. 6 Gould pump, placed in the discharge line from the tank and operated by power from the truck transmission. The manifold is suspended from the rear of the truck by swivel joints which allow the entire manifold to be swung up out of the way when not in use. The distributing manifold is equipped with leaders terminating in nozzles, each of which discharges a fan-shaped stream which can develop a width of 8 in. in an 8-in. fall. The valves are operated in sets of four by means of levers, the sets being capable of operation separately or together. The pump can be thrown out of gear when not needed. The pressure at the nozzles can be controlled by a regulating valve placed in a by-pass line around the pump, and is shown by a pressure gauge on the discharge line. It is stated that the machine can be regulated by the operator to apply from .10 to .53 gal. per sq. yd. of surface.

The distributor is built by the Good Roads Machinery Co., Inc., of Kennett Square, Pa., and is mounted on an Autocar chassis, built by the Autocar Company of Ardmore, Pa. It is known as the American Champion heating distributor.

New Road Grader

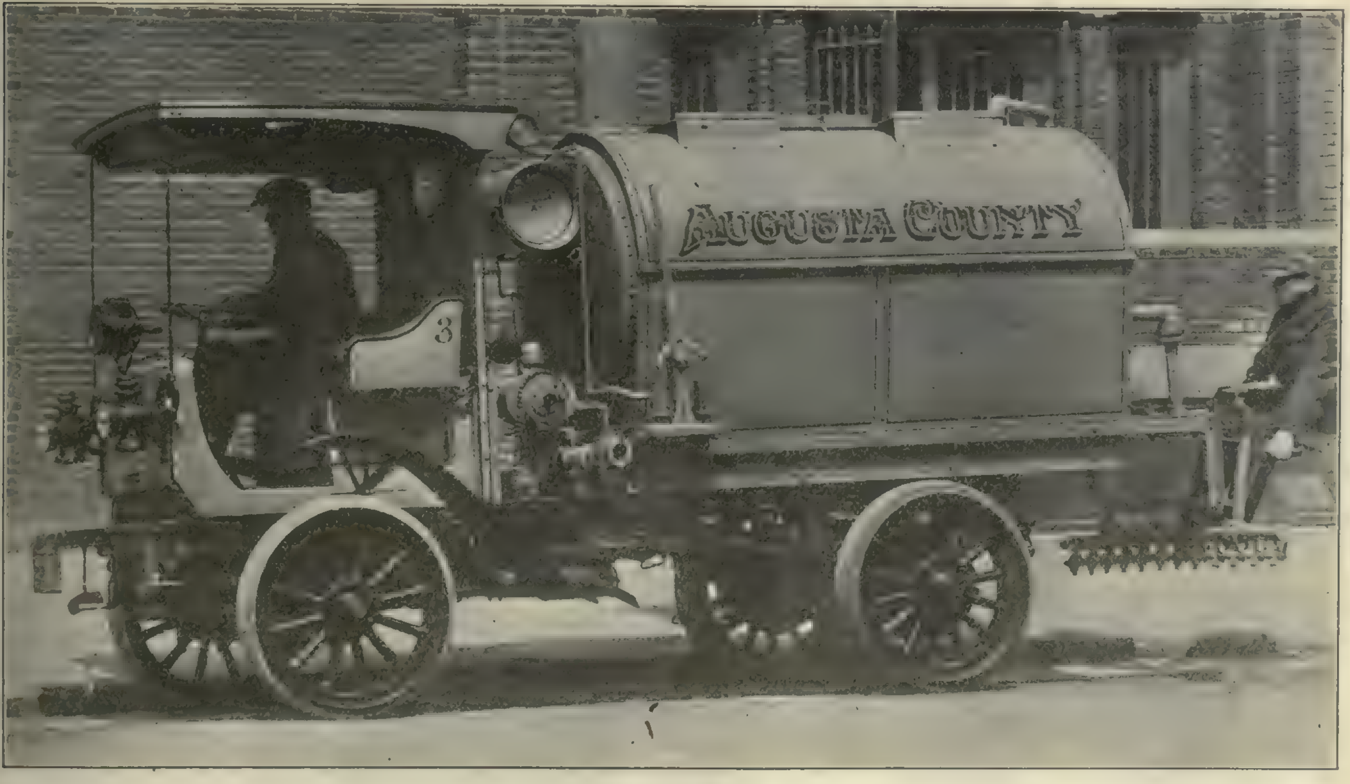
A pamphlet descriptive of the Martin farm ditcher and road grader has recently been issued by the manufacturer of the machine, the Owensboro Ditcher & Grader Co. of Owensboro, Ky.

The ditcher consists of a scraper blade and guide board, provided with a seat for the operator and a hitching device. The scraper blade can be replaced by a dragging attachment when the machine is to be used for road dragging. The grader is made of steel and can be operated in some instances by one man and two horses and, according to the manufacturer's statement, never requires more than four horses and two men.

The machine can be used either for cutting ditches and scraping the material out or for leveling a roadway in the same manner as a road drag.

Railway Substitution in the Uinta Region of Utah

One of the highways which the state highway officials of Utah have found it necessary to construct even under the conditions which obtain in relation to the scarcity of labor for road improvement is the highway from Price to



AMERICAN CHAMPION HEATING DISTRIBUTOR, BUILT BY THE GOOD ROADS MACHINERY CO., INC., MOUNTED ON AN AUTOCAR CHASSIS.

Myton, upon which it is stated the work will proceed as rapidly as possible in order that the abundant crops of the Uinta region may reach the market centers without delay.

The Uinta Basin contains an immense acreage of excellent agricultural lands, but is without railway facilities. Recently a creamery company located at Duchesne has purchased a 1-ton Garford truck and a trailer of about 2 tons capacity for the transportation of cream from Vernal and adjacent points to the company's plant, and for delivering the finished product, butter, to the shipping point at Helper. The truck will make semi-weekly trips between Vernal, Duchesne and Helper, and will undoubtedly mark the beginning of the motor truck industry in the Uinta country.

The Blaw-Knox Company

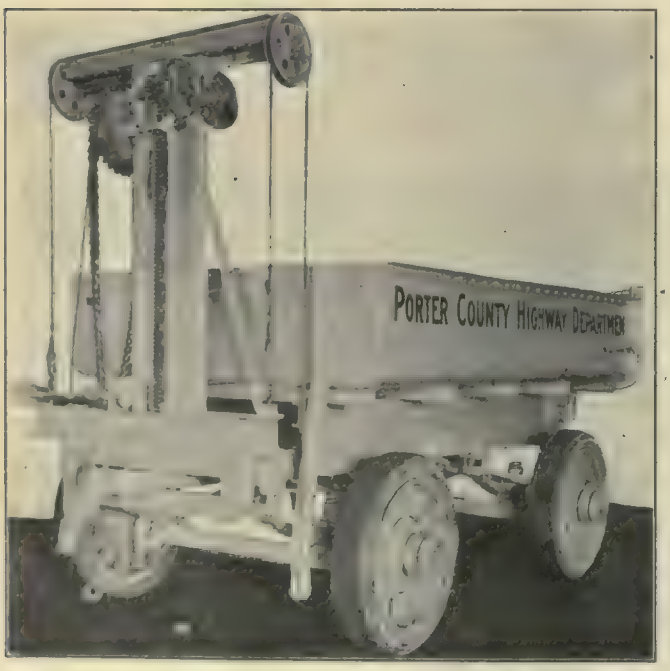
Announcement has been made of the consolidation of the Blaw Steel Construction Co. and the Knox Pressed & Welded Steel Co. The new firm is known as the Blaw-Knox Company and is situated in Pittsburgh.

The Blaw-Knox Company has taken over all the contracts of the two former companies and announces that they will be carried out without interruption. Albert C. Lehman, formerly President of the Blaw Steel Construction Co., is President of the Blaw-Knox Company.

End Dumping Body and Hand-Operated Hoist for Trailers

A new trailer body with hand-operated hoist for end dumping is shown in the accompanying illustration.

The body, which is shown mounted on a 5-ton reversible Troy trailer, is built of 3/16-in. steel plates. The frame of the hoist is built of channel sections with steel rack, gears and pinions.



END DUMPING BODY AND HAND-OPERATED HOIST, BUILT BY THE ARCHER IRON WORKS, MOUNTED ON A TROY TRAILER.

The hoist is operated by hand and raises the body to an angle of 45 degrees. The gear ratio is such that the body can be raised to dumping position by one man in two minutes. The body is lowered by means of a small friction brake.

The body and hoist are built by the Archer Iron Works of Chicago, Ill.

Unloading Road Material by Machinery

One method of hastening unloading operations and thereby helping to relieve the existing freight congestion is shown in the accompanying illustration.

Crushed stone received by a New Jersey contractor on a siding of the Pennsylvania Railroad at New Brunswick was transferred from the cars to motor trucks with a Lee loader manufactured by the Lee Loader & Body Co. of Chicago, Ill. It is stated that the material handling device was the first of its kind to be used in the town and that the freight agent was so impressed with the speed of the unloading operations that he secured information from the manufacturer of the loader and distributed it among contractors, coal dealers and industrial concerns receiving material at the New Brunswick yard. He also, it is said, reported the matter to the division office of the railroad in order to bring it to the attention of other agents on the line.

LOADING TRUCK AND TRAILER WITH CRUSHED STONE WITH A LEE LOADER.

Notes

The Milton Hersey Co., Ltd., of Montreal, P. Q., have been retained as specialists on the asphalt paving work to be done on the Quebec-Montreal Highway. C. A. Mullen has charge of the paving department of the company.

The Walter A. Zelnicker Supply Co., of St. Louis, Mo., has issued Bulletin No. 221, listing offerings in rails, locomotives, cars, cranes, pipe, piling and tanks. The main office of the Zelnicker Company is 325 Locust street, St. Louis.

The Duplex Truck Co., of Lansing, Mich., has announced the appointment of Andrew Langenbacher as sales manager of the corporation. Mr. Langenbacher was formerly in charge of exports as well as a sales division of the Reo Motor Car Co. It is expected that in order to handle the $12,000,000 worth of trucks to be manufactured next year, the dealer organization of the company must be doubled at once.

An eight-page folder describing the Blaw "Bulldog" bucket has recently been issued by the Blaw-Knox Company of Pittsburgh, Pa. The folder carries two illustrations of the bucket, one showing it open and the other closed. The text consists of a description of the bucket, with a table showing the weights and dimensions of the various models. The folder is 3¼x6¼ in. in size and is printed in two colors.

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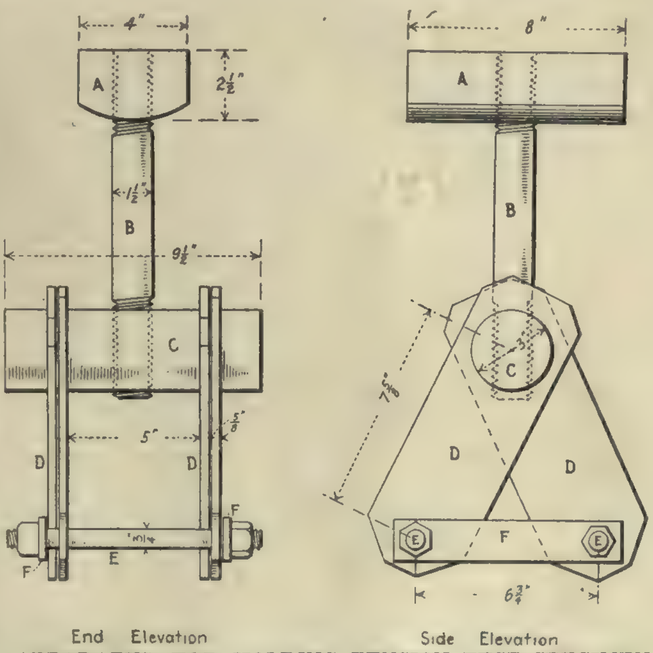
Tests of Concrete Road Aggregates*

By J. P. NASH†

With the increasing mileage of concrete roads constructed each year comes the pertinent question as to the most desirable materials to use in their construction, and also the proper methods of mixing, laying and curing the concrete. The effects of the latter variables, namely, the mixing, laying and curing, are fairly well known; but the wearing qualities under continued traffic for a period of years have not been fully demonstrated, as few concrete roads have been in existence as long as ten years. Most of the properties which a concrete for road construction should possess are the same as it should have for any other purpose, with one additional property—it must resist the abrasive action of traffic. The tensile strength also plays an important function in a concrete road, as it is that property which largely determines the number of cracks.

The resistance to abrasion is determined by the tenacity of the aggregates to hold together under impact and friction, and also by the resistance to wear of the separate aggregates. The resistance of the aggregates to separation is a function of the cement and the cleanness and grading of the aggregates, while the resistance of the aggregates to wear is an inherent property of the aggregates themselves. By far the greater proportion of cracks in a concrete road are contraction cracks. When the material contracts tensile stresses are set up due to the friction of the concrete on the sub-base. The road cracks when this friction is greater than the tensile strength of the concrete slab. Other things being equal, the concrete having the highest tensile strength will have fewest cracks.



APPARATUS FOR HOLDING TENSION TEST SPECIMEN AT TOP—A SIMILAR APPARATUS, INVERTED, HOLDS BOTTOM OF SPECIMEN.

Object of the Tests

The object of the tests described in this paper was to determine the resistance to abrasion and the tensile strength of concrete made with various aggregates. In these tests the chief variable was the coarse aggregate. The sand used in most of the tests was a well graded Colorado River sand, passing a ¼-in. sieve. However, where the coarse aggregate was graded to ⅛ in. a finer sand was used. The Colorado River sand is composed of rather angular fragments of flint, quartz, and a small proportion of limestone. With the exception of a slag from Birmingham, Ala., and a sample of gravel from New Orleans, all the materials used were from Texas. Similar materials may be found in most parts of the United States.

The writer desires to express his appreciation of the excellent work done by Prof. Charles F. Shoop, of the University of Minnesota, along the same line as this. The specimens used by the writer are of such a size that the results may be compared with those found by Professor Shoop.

Description of the Tests

Making the Specimens.—The amount of material on hand to make the tests was meager. The samples were sent to the laboratory by producers, who in no case furnished the full amount requested. The number of test specimens made, consequently, had to be limited in number to one for the abrasion test, one for the tension test, and, in most cases, only two for the compression test.

The concrete was mixed on the floor, with shovels, to a medium consistency and tamped in the molds with a ⅝-in. round steel bar. After 24 hours the specimens were removed from the molds and placed in wet sand for 6 days, when they were removed and stored in the laboratory without further moistening, until tested at the end of 28 days.

The molds used for these tests were made of No. 16 galvanized sheet iron. Later cast iron molds were procured.

The compression specimens were 6 in. in diameter and 12 in. high, made on plate glass so that a plane surface was secured on one end, the other being bedded in plaster of Paris when tested.

The tension specimens were similar in shape to the standard cement briquettes, having a sectional area at the center of 25 sq. in. The specimen was 5 in. deep and at the narrowest part was 5 in. wide, while the length was 12 in. With a specimen of this type the concrete may be placed in the mold in the same way in which it is placed on the road. The line of stress is also the same in both cases.

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*Paper presented at the 20th annual meeting of the American Society for Testing Materials, Atlantic City, N. J., June 26-29, 1917.

†Testing Engineer, University of Texas.

TABLE I—SHOWING THE COMPRESSIVE AND TENSILE STRENGTH AND RESISTANCE TO ABRASION OF CONCRETE MADE FROM VARIOUS AGGREGATES.

Except Where Noted, Well-Graded Colorado River Sand (Composed of Sharp Grains of Flint, Quartz, and Limestone) Was Used as the Finer Aggregate.

Laboratory No.	Nature of Aggregate.	Size of Aggregate, in.	Proportions.	Grading of Aggregate Percentage Passing Sieve: 2 in.	1½ in.	1 in.	½ in.	¼ in.	Results Con. Tests. Compressive Strength, lb. per sq. in.	Tensile Strength, lb. per sq in.	Loss in 1,000 Revolutions, per cent.	Appearance of Abrasion Specimen after 2000 Revolutions.
	Gravel.											
2783(a)	Composed of rounded and some flat pebbles of limestone and sandstone.	¼-2	1:2:4	100	95	78	29	0	3,290	247	2.6	Specimen contained a number of swellings and depressions and a few stones were knocked out of surface; however, specimen was fairly uniform. Swellings due to the large size of the aggregate.
2765	Composed of clean, smooth pebbles of quartz, flint, and a little limestone.	¼-2	1:2:4	100	86	50	15	2	2,860	222	2.8	Surface very rough. Flints worn practically not at all, and a number were knocked out of surface. The limestones wore equally with the mortar.
2922	Composed of clean, smooth pebbles of flint, quartz, and gneiss.	¼-2	1:2:4	100	87	71	7	0	2,010	284	3.3	Surface wore very rough, the softer stones wearing equally with the mortar, while the hard flints and quartzites were worn very little.
2821	Composed of pebbles of granite, flint, quartz, and limestone.	¼-1½	1:2:4	100	100	71	39	3	2,720	260	4.1	Surface quite rough, the flints and quartzite wearing practically not at all, while limestones wore equally with the mortar.
2872	Composed of rounded pebbles of limestone, sandstone and shells.	¼-1¼	1:2:4	100	100	91	43	0	2,180	244	4.5	Surface uniform and smooth, similar to limestone specimens.
2930-A	Rounded pebbles of limestone with some flint and quartz.	⅛-2	1:2:4	100	92	75	37	7	2,950	...	4.6	Surface rather rough, the limestones wearing equally with the mortar, while flints and quartz protrude as much as ½ in. from surface. Some stones have been knocked out of the specimen.
2732	Composed of rounded pebbles of flint, quartz, granites, and limestone.	¼-2	1:2:4	100	84	62	21	0	3,100	268	4.7	Surface very rough; flints fail to wear to any extent, granites crack and are smooth, while limestone wears equally with the mortar.
2930-D(b)	Composed of limestone pebbles with some flint and quartz.	⅛-2	1:2.2:4	100	92	75	37	7	1,580	...	7.9	Surface rather rough, the limestone pebbles wearing equally with the mortar, while the flints have worn practically not at all.
	Limestone.											
2795	Rather soft, with a sharp angular fracture.	¼-1½	1:2:4	100	100	76	24	2	3,265	284	3.0	Surface rather uniform. Where soft stones were not surrounded by harder ones, a slight depression developed.
2929	Fairly hard and uniform, with a rough fracture.	¼-1½	1:2:4	100	99	70	14	2	2,670	222	3.0	Surface very uniform. Some slight depressions and swellings were apparent, due probably to some inequalities in the hardness of the stone.
2755	Rather soft, some very soft stones, occasional cherts.	¼-1¼	1:2:4	100	100	84	18	1	2,600	236	3.6	Surface smooth, except an occasional chert, which produces a swelling on the surface.
2831	Angular fragments a few of which are soft stones.	¼-1	1:2:4	100	100	[illegible]	20	1	2,120	230	3.7	Surface in good condition, being smooth and free from depressions.
2906-B(c)	Flat and angular fragments of limestone, rather uniform.	⅛-1¼	1:2:4	100	100	94	42	14	2,160	202	3.8	Surface in good condition, being quite smooth.
2830	Angular fragments, but contains some soft stone.	¼-2	1:2:4	97	84	48	10	3	2,460	228	4.0	Surface somewhat rough; the larger stones did not wear equally with the smaller ones and the mortar.
2810	Somewhat soft, but uniform.	⅛-1½	1:2:4	100	100	65	33	9	.....	...	4.0	Surface rather smooth; however, there were a few slight swellings and depressions.
2906	Flat and angular fragments, but uniform.	⅛-1¼	1:2:4	100	100	94	42	14	2,120	260	4.4	Surface uniform and smooth.
2952-(c)	Somewhat soft, flat and angular fragments.	⅛-1	1:2:4	100	100	100	51	13	1,785	232	4.8	A superior surface, being uniform and smooth.
	Trap Rock.											
2569-I	Hard and tough, angular fragments.	¼-1¼	1:1½:3	100	99	92	23	0	2,580	216	1.8	Surface somewhat rough, the stones protruding; the mortar was worn considerably.
2871-D(d)	Hard and tough, angular fragments.	⅛-1	1:1½:3	100	100	100	57	14	3,490	312	2.1	A superior surface, free from depressions or any inequalities.
2569-H	Hard and tough, angular fragments.	¼-1¼	1:2:4	100	99	92	33	0	.....	288	2.1	Surface comparatively rough; stones wore round, while mortar was worn considerably, leaving the stones protruding. The actual wear, however, was uniform.

TABLE I. Continued.

Laboratory No.	Nature of Aggregate.	Size of Aggregate, in	Proportions	Grading of Aggregate Percentage Passing Sieve: 2-in.	1½ in.	1 in.	½ in.	¼ in.	Results Con. Tests. Compressive Strength, lb. per sq. in.	Tensile Strength, lb. per sq. in.	Loss in 1,000 Revolutions, per cent.	Appearance of Abrasion Specimen after 2000 Revolutions.
2871-B(d)	In angular fragments. Very hard and tough.	⅛-1	1:2.2:4.4	100	100	100	57	14	1,970	248	2.9	Surface comparatively smooth, except for an occasional large stone which protrudes above the surrounding surface.
2871-A(d)	Hard and tough, angular fragments.	⅛-1	1:2:4	100	100	100	57	14	2,300	280	3.2	Surface comparatively uniform, presenting an even surface. Some of the larger stones protruded slightly above surrounding surface.
	Slag.											
2889	Sharp, angular fragments, the greater proportion dense; remainder somewhat porous.	¼-2	1:2:4	100	79	62	8	1	2,850	...	2.4	Surface rather uniform, although a number of the larger stones failed to wear equally in amount to the smaller ones, causing slight swellings. Surface rather porous and might be a good surface to treat with a bituminous material.

(a) Sand from same pit as gravel screened below ¼ in. having 23% retained on ⅛-in. sieve, 35% retained on No. 10 sieve, 94% retained on No. 48 sieve, 100% retained on No. 200 sieve.

(b) Sand from same pit as gravel screened below ⅛ in. having 4% retained on No. 10 sieve, 63% retained on No. 48 sieve, and 95% retained on No. 200 sieve.

(c) Well graded Colorado River sand under ¼ in.

(d) Used a medium fine sand having 0.0% retained on No. 10 sieve, 65% retained on No. 48 sieve, and 98% on No. 200 sieve. Composed of flint and quartz grains.

The abrasion specimens consisted of a large concrete ring 20 in. in inside diameter, 28 in. in outside diameter, and 8 in. deep. The 4-in. thickness of concrete was reinforced with two steel rods to prevent cracking from unequal stresses in the rattler. The specimen was molded between two concentric metal forms held in place by metal spacers. This specimen can be handled by one man without the assistance of any apparatus, the average weight being about 200 lb.

Testing the Specimens.—In testing the compression and tension specimens a 100,000-lb. Olsen testing machine was used, the load in both cases being applied at a speed of 0.05 in. per minute. One end of each compression specimen was bedded in plaster. In testing, the spherical bearing block was placed at the top. Grips were devised for the tension specimens so that when the load was applied the specimen would adjust itself to a direct pull and the pressure of the grips would be distributed equally on the specimen at all points.

The tension apparatus (shown in the figure) consists of a cast iron block, A, with a rocker bearing which rested on the top of the testing machine. Through the center of this rocker a 1½-in. round bar, B, is screwed, which is also screwed into another cast iron block, C. This makes it possible to take the apparatus off the testing machine. The ends of this lower block are turned true in the lathe and two flat bars, D, are hung from each end. This leaves a clear space of 5 in. between these two pairs of bars, allowing the specimen to hang between them. Through a hole in the lower ends of these bars two ¾-in. round bars, E, are placed at right angles. These bars serve as bearings for the specimen. Side spacing bars, F, hold them apart, while the specimen hangs on the ¾-in. round rods. This arrangement was duplicated in inverted position from the moving head of the machine, which served to grasp the lower half of the tension specimen.

The apparatus was designed to test any specimen up to the capacity of the machine, and it was found that it was somewhat unwieldy. A lighter apparatus was designed later. This will test specimens up to 20,000 lb. total load, which is ample for any concrete that it is possible to make. The direct tension is assured with the apparatus by a welded eye from which the clip hanger allows a limited universal motion.

In order to determine what variation might be expected in the results of the tension tests four independent series of tests were made, each series consisting of three specimens made on different days. Exceptions to this were the three tests made on the Ottawa sand briquettes, which were all made from the same batch. A different mix was used for each series. The results obtained from these series are given in Table II. From these results it is reasonable to assume that a single tension test would fall within 10% of the average. Results on other tests, not included here, indicate that the probable error on concrete specimens is much smaller, being closer to 5 than 10%. The specimens were tested at the rate of 40 lb. per sq. in. per minute.

In order to determine how closely the large 5-in. briquettes could be expected to check with the smaller 1-in. standard briquettes some 1:3 Ottawa sand mortar was made into briquettes of both sizes at the same time. The speed of the small tension testing machine was regulated to that of the large machine so that the rate per square inch of load would be the same. It was found that the smaller briquettes tested 12.4% higher than the larger briquettes when tested with the old apparatus shown in the figure, and 2.1% higher when the large briquettes were tested with the new apparatus. It is believed, however, that this difference is due to the variations that might enter in making and curing the specimens rather than in the apparatus. For instance, the mortar tested with the old apparatus was mixed with shovels on the floor, while that tested with the new apparatus was kneaded by hand, according to standard methods.

TABLE II.—RESULTS OF AN INDEPENDENT SERIES OF TENSION TESTS.

Mix.	Tensile strength, lb. per sq. in.		Maximum variation from avg., per cent.
1 Cement : 3 Ottawa sand	202, 220, 216	Average 213	5.2
1 Cement : 3 Colorado River sand	264, 263, 294	Average 274	7.8
1 Cement : 2 Colorado River sand : 4 Colorado River gravel	275, 274, 275	Average 275	0.4
1 Cement : 1½ Colorado River sand : 3 Colorado River gravel	288, 304, 280	Average 291	4.0

TABLE III.—ABRASION TESTS OF THREE SPECIMENS.

1 Part Cement : 2 Parts Colorado River Sand : 4 Parts Colorado River Gravel. Age, 28 Days.

First specimen lost	3.81%	by weight in 1,000 revolutions
Second specimen lost	3.70%	" " " " "
Third specimen lost	2.88%	" " " " "
Average	3.45%	" " " " "

The abrasion test on the concrete rings was made in the standard brick rattler, having alternate staves removed. This was done in order to lighten the load on the pulley. The axis of the specimen was aligned with the axis of the barrel by driving wooden wedges between the staves and the specimen. After the shot were placed in the ring the moving head of the barrel was brought in contact with the specimen, holding it in place. The rattler revolved at the rate of 30 r.p.m., which was sufficient to cause the shot to ride up the specimen while it revolved. This permitted some of the shot to slide upon the concrete while others dropped from the top of the pile with a certain amount of impact. The charge used consisted of 139 cast iron cubes measuring 1½ in., with rounded edges. In addition there were six rectangular shot, 2⅝x2⅝x4½ in., which brought the total weight of the charge up to 158 lb.

After each 500 revolutions the specimen was cleaned of all dust and weighed in order to determine what effect the number of revolutions would have on wear. It was found that the specimen lost approximately the same amount each 500 revolutions. The specimen was tested for 2,000 revolutions, but the percentage loss was calculated for 1,000 revolutions. The character of the surface of the specimens was carefully noted after each test. These observations furnish some of the most important features of these tests.

In the abrasion tests individual results show considerable variation from the average, as is apparent from the results of testing three specimens made of the same materials at different dates, given in Table III. The maximum variation from the average is 16.8%. While this variation may seem excessive, it should be kept in mind that the chances for variation with a gravel specimen are larger than with crushed stone. This is due to the fact that a different number and size of the stones are knocked out of the surface of the gravel concrete in each of the specimens, while concrete made of ordinary crushed stone shows no such loss.

Result of Tests

The results of the various tests have been arranged in Table I, according to resistance of the concrete to abrasion. These results are accompanied by brief remarks upon the appearance of the specimen after 2,000 revolutions. While the number of tests is somewhat limited for judging the relationship existing between the various tests, it seems that there is practically no such relation.

Abrasion Tests.—If the relation between the number of revolutions of the specimen and the traffic were known it would be possible from the test to determine how long a concrete road could be expected to be satisfactory. It does not seem unreasonable to suppose that the effect of one revolution of the specimen is equivalent to that of ten steel-tired vehicles. Certainly the tests show this in a relative sense, which is quite satisfactory.

One of the most important factors in road construction is to procure a surface that is uniform and will wear uniformly. Especially is this true with a rigid road such as concrete makes. It should be smooth enough to allow the vehicles to roll over the surface without appreciable impact, and yet rough enough to afford a horse good footing, especially in wet weather and upon steep grades. It is, therefore, just as important to know the character of the surface of the concrete after the test as it is to know the numerical loss.

The Gravel Aggregate.—The surface of most of the gravel concrete specimens was rough. Such gravel specimens as No. 2930-A and No. 2732, containing pebbles of varying hardness, produce a surface in which the hard flints wear but little, while the softer limestones wear equally with the mortar. In many cases these flints protrude as much as ½ in. above the surrounding surface. Other gravels, such as No. 2765, are composed of pebbles of equal hardness. However, they are so much harder than the surrounding mortar that the latter wears much faster than the stones, causing a somewhat uniform, but extremely rough, surface. The hard stones are knocked out, causing more than normal pitting and loss in the specimen. An exception to the general run of the gravels is one such as No. 2872, composed of limestone and sandstone pebbles only, which have approximately the same hardness. In this case the pebbles themselves were but little, if any, harder than the mortar, and consequently the specimen wore surprisingly uniformly. In this particular instance it should be noted that the gravel contained no pebbles over 1¼ in. in size which undoubtedly influenced the satisfactory condition of the surface.

Crushed Stone Aggregates.—Where crushed limestone was used as the coarse aggregate the surface as a rule was smooth and uniform. The limestones tested were all comparatively soft and they wore equally with the mortar. In specimens where the aggregate contained some large stones (No. 2830) the surface became somewhat wavy, due to the fact that the larger stones did not wear as fast as the smaller ones. In those specimens in which the aggregate was below 1½ in. in size the surfaces were very satisfactory. In one or two of the specimens that contained some very soft stones there was a tendency for these stones to be pitted. This, however, does not seem to be any serious disadvantage.

With the crushed trap rock specimens the results are interesting. The stone is a basalt, having high resistance to abrasion in the Deval machine, and very tough. Trap rock from the same quarry was used in all the tests. In the 1:2:4 concrete specimens the mortar wore faster than the stone, giving the surface a distinctly mosaic appearance. This was more noticeable with the larger sized aggregates.

In the 1:1½:3 concrete specimens the mosaic appearance of the surface was still apparent with the larger sized aggregate; but with that graded only to 1 in. the surface was very satisfactory, having but few protruding stones. This latter specimen also had a high resistance to abrasion.

The specimen in which slag was used for the coarse aggregate (No. 2889) had a rather high resistance to abrasion and a fairly uniform surface. It is believed that if this aggregate were limited in size to about 1¼ in. the surface would be very smooth. The surface appeared rather porous when enough of the slag fragments had been worn away to expose their interior. From this apparent porosity of the specimen it would seem that it should make a satisfactory surface for a treatment of asphalt or tar.

Tension Tests.—From the results given in Table I, it is apparent that no relation exists between the compressive and tensile strengths of any given concrete. When the limestone concrete fails in tension practically all of the stones are broken, but with gravel there is always quite a number of stones that are pulled out rather than broken. The number broken depends upon the smoothness of the stones, but even with the very smooth stones a good proportion of them break.

It is preferable that the tensile strength of concrete for road construction shall be obtained by using superior aggregates rather than additional cement, because the contraction due to setting of the concrete increases with the amount of cement, which tends to nullify the extra strength obtained.

Comparison of Field and Laboratory Concrete

There is a great similarity between the results obtained in the laboratory and those shown in actual construction. A portion of San Pedro Avenue in San Antonio, Texas, was constructed about four years ago of a concrete composed of 1 part of cement, 2 parts of medium fine sand, and 4 parts of a soft local limestone. This street carries a fairly heavy traffic, and is in excellent condition today, being smooth and free from depressions. While this is a poorer concrete than any of those tested, the appearance of the surface is practically the same as that of the surface of the limestone specimens. The surface of this street would seem to indicate that

(*Concluded on page* 114)

Massachusetts State Road Laws Codified

The 1917 Legislature of Massachusetts codified the laws of the state relating to highways and bridges. The act making this codification is designated as Chapter 344 and is divided into eight parts. Part 1, which covers the matter of state highways, is as follows:

Section 1. There shall be a Massachusetts highway commission consisting of three persons, one of whom shall annually be appointed by the governor, with the advice and consent of the Council, for a term of three years. The chairman shall be designated by the governor and shall receive an annual salary of $5,000. Each of the other members shall receive an annual salary of $4,000. Each member of the commission shall be allowed his traveling expenses, and shall devote his time to the business of the commission. The commission may expend annually for a secretary, clerk hire, engineers and for incidental expense such amount as the General Court may appropriate. It shall be provided with an office in the State House or some other suitable place in the City of Boston, in which the records of its office, maps, plans and statistics collected and compiled under its direction shall be kept.

Section 2. It shall compile statistics relative to the public ways of counties, cities and towns, and make such investigations relative thereto as it shall consider expedient. It may be consulted by, and shall, without charge, advise officers of counties, cities or towns having the care of and authority over public ways, as to their construction, maintenance, alteration or repair; but such advice shall not impair the legal duties and obligations of any county, city or town. It shall prepare maps of the commonwealth on which shall be shown county, city and town boundaries, the public ways and the state highways, with their names if practicable. It shall give suitable names to state highways and may change the name of any way which becomes a part of a state highway. It may erect suitable guide posts and markers at convenient points on state highways or on ways leading thereto. It shall collect and collate information relative to the geological formation of the commonwealth so far as it relates to the materials suitable for road building, the location of which it shall, so far as practicable, designate on said maps, which shall be open to the inspection of officers of counties, cities and towns having the care of and authority over public ways. It shall give public notice of and hold at least one public meeting annually in each county for the open discussion of questions relative to the public ways.

Section 3. It shall make an annual report to the General Court of its doings and the expenditures of its office, with such statements relative to the construction and maintenance of public ways and such recommendations as to the general policy of the commonwealth relative thereto as it considers appropriate. The report shall be transmitted to the secretary of the commonwealth on or before the first Wednesday in January.

Section 4. County commissioners and city and town officers who have the care of and authority over public ways and bridges shall, on request, furnish the commission with any information required by it concerning such ways and bridges.

Section 5. If the county commissioners of a county, the mayor and aldermen of a city or the selectmen of a town adjudge that the public necessity and convenience require that the commonwealth lay out and take charge of a new or an existing way as a highway in whole or in part, in their county, city or town, they may apply by a petition in writing to the commission, requesting that said way be laid out and taken charge of by the commonwealth.

Section 6. If said commission determines that public necessity and convenience require that such way should be laid out or be taken charge of by the commonwealth, it shall file a certified copy of a plan thereof, a copy of the petition therefor and a certified copy of a certificate that it has laid out and taken charge of said highway in accordance with said plan, in the office of the county commissioners for the county in which the way is situated, and shall file a copy of the plan showing the location of the portion lying in each city or town in the office of the clerk of such city or town, and a copy of the certificate that it has laid out and taken charge of said highway in accordance with said plan, and thereafter it shall be a state highway, and shall be constructed and kept in good repair and condition by the commission, at the expense of the commonwealth. In laying out and taking charge of a way as a state highway the commission may adopt the boundary or location lines of the way theretofore existing, or it may lay out such state highway at a width greater or less than that of the existing way, and if a state highway be laid out where no way existed previously, the width of such state highway shall be as the commission shall deem necessary. If the width of a state highway be less than that of the way previously existing, that portion of the way which lies between the boundary or location lines of the state highway and the boundary or location lines of the way previously existing shall remain a public way unless the commission shall determine that it should be abandoned; provided, however, that the county commissioners of the county or the city or town in which the way is situated, whichever has jurisdiction of the way, may abandon at any time said portion in the manner provided by law for the alteration, relocation or discontinuance of public ways.

Section 7. Said commission may, with the concurrence of the mayor and aldermen of a city or the selectmen of a town, alter the location of a state highway in such city or town by filing a plan thereof and a certificate that said commission has laid out and taken charge of said state highway, as altered in accordance with said plan, in the office of the county commissioners for the county in which said highway is situated, and by filing a copy of the plan or location as altered in the office of the clerk of such city or town

Section 8. Said commission may, with the concurrence of the mayor and aldermen of a city or the selectmen of a town, abandon any land or part thereof, or rights in land which have been taken or acquired by it in such city or town by executing, acknowledging and recording a deed thereof accompanied by a plan of survey which shall be recorded therewith. Said abandonment shall revest the title to the land or rights abandoned in the persons in whom it was vested at the time of the taking, or their heirs and assigns, and may be pleaded in reduction of damages in any suit therefor on account of such taking.

Section 9. The damages sustained by any person whose property has been taken for or has been injured by the construction or alteration of such highway shall be determined by said commission and shall be paid by the commonwealth. A person who is aggrieved by such determination may, upon a petition filed in the superior court for the county in which the land lies, within one year after the completion of said highway or alteration thereof, have his damages determined by a jury in the same manner as damages which have been sustained by the taking of land for other highways. The mayor of a city, if so authorized by a vote of the board of aldermen, or body having like powers, or the selectmen of a town, if so authorized by a vote of the town, may stipulate in writing in behalf of the city or town to indemnify and save harmless the commonwealth against all claims and demands for damages which may be sustained by any person whose property has been taken for, or has been injured by the construction or alteration of, any highway which the Massachusetts Highway Commission proposes to lay out and construct or alter as a state highway, and thereupon such city or town shall be liable ultimately for the amount of any verdict against the commonwealth for such damages, and for costs, the amount thereof to be recoverable by the commonwealth in an action of contract.

Section 10. Said commission shall, when about to construct a highway, give to each city and town in which it lies a copy of the plans and specifications therefor and a notice that said commission is ready for its construction; and said city or town may, without advertisement, contract with said commission for the construction of so much of such highway as lies within its limits, in accordance with the plans and specifications and under the supervision and subject to the approval of the commission, at a price agreed upon between said commission and said city or town. If, within ten days, said city or town does not elect so to contract, or if it has waived the right to contract, said commission shall advertise in two or more newspapers published in each county in which the highway lies, and in three or more daily newspapers published in Boston, for sealed proposals for the construction of such highway, stating the time and place for opening said proposals, and reserving the right to reject any and all proposals. Said commission may reject any and all proposals, or, if a proposal is satisfactory, it shall, with the approval of the governor and council, make a contract in writing on behalf of the commonwealth for such construction. After the proposals have been accepted or rejected they shall be kept by the commission, and shall be open to public inspection for a term of three years, and may then be destroyed or caused to be destroyed by the commission. The commission may, in the same manner and under the same conditions, contract with a city or town, or, if a city or town shall not elect so to contract, with a person for the grading of a state highway or for furnishing labor, materials or any other element in its construction. The construction of all state highways shall be under the supervision and subject to the approval of the commission and in accordance with plans and specifications furnished by it, shall be fairly apportioned by the commission among the different counties, and not more than 10 mi. of state highway shall be constructed, on petition as aforesaid, in any one county in any one year, without the previous written approval of the governor and council.

Section 11. Said commission shall keep all state highways reasonably clear of brush, shall cause suitable shade trees to be planted thereon if practicable, and may establish and maintain watering troughs upon said highways.

Section 12. The commission, with the consent of the owner, is directed to remove the trees, limbs of trees, shrubbery or any structure or other obstacle from lands bordering upon state highways, which in the opinion of the commission obstruct the view of persons traveling upon the highway or make traveling thereon dangerous. In case the owner does not desire the material which has been so removed, the said commission may sell or otherwise dispose of the same, and if it is sold the amount so received shall be used toward defraying the expense of removing such material. Said commission shall cause all debris resulting from any cutting or trimming done along the state highway, under authority of this or of any other act, to be disposed of in such manner that it will not constitute a fire menace to adjoining property.

Section 13. One-fourth of any money which may be expended under the provisions of the eight preceding sections for a highway in any county, with interest thereon at the rate of 3% per annum, shall be repaid by said county to the commonwealth in such installments and at such times within six years thereafter as said commission, with the approval of the auditor of accounts, having regard to the financial condition of the county, shall determine. The treasurer and receiver general shall apply the money so repaid to the appropriation to be expended by said commission.

Section 14. To carry out the provisions of law requiring the weekly payments, and to secure cash discounts wherever possible, the commission may receive such advances of money from the treasury of the commonwealth as in the judgment of the auditor of the commonwealth are required for said purposes.

Section 15. The mayor or the board or officer having charge of the maintenance and care of highways, of a city, if so authorized by a vote of the city council, or other governing body, or the selectmen or road commissioners of a town, or officer having charge of the maintenance and care of highways in a town, if so authorized by a vote of the town, may agree in writing, in behalf of such city or town, to contribute money, labor or materials toward the cost of any state highway which the Massachusetts Highway Commission proposes to lay out and construct within the limits of such city or town.

Section 16. The commonwealth shall be liable for injuries sustained by persons while traveling on state highways, if the same are caused by defects within the limits of the constructed traveled roadway, in the manner and subject to the limitations, conditions, and restrictions specified in Sections 24, 26 and 27 of Part 4 of this act, except that the commonwealth shall not be liable for injury or damage sustained by any persons because of the want of a railing in or upon any state highway, nor unless that notice of the injury as required by law is given to a member of the commission or to its secretary. The commonwealth shall not be liable for an injury which may be sustained upon the sidewalk of a state highway or during the construction, reconstruction or repair of such highway. The amount which may be recovered for any such injury shall not exceed one-fifth of one per cent. of the state valuation, last preceding the commencement of the action, of the city or town in which the injury was received, nor shall it exceed $4,000.

Section 17. A city or town in which a state highway lies shall at its own expense keep such highway sufficiently clear of snow and ice to be reasonably safe for travel. It shall have police jurisdiction over all state highways within its limits, and shall forthwith give notice in writing to the commission or its employees of any defect or want of repair in such highways; but it may make necessary temporary repairs of a state highway without the approval of the commission.

Section 18. The Massachusetts Highway Commission shall have the same power as the mayor and aldermen of cities and the selectmen and road commissioners of towns in relation to the purchase or taking of land from which may be taken materoals necessary for the construction, repair or improvement of state, county, city or town highways in the manner provided in Section 76 of Part 2 of this act; provided, however, that all contracts for such purchase and all takings by said commission shall first be approved by the governor and council. Such purchases or taking shall not operate in any way to interfere with the control of the police departments of the various municipalities within the land so taken. Land taken under the provisions of this section shall be held and used for no other purpose than as specified herein; provided, however, that said commission may allow county, city or town officers to use materials from said land for the above specified purposes upon such terms as may be agreed upon. For this purpose the commission may expend a sum not exceeding $5,000 in any one year. Said sum may be taken from the money applicable to the construction or maintenance of state highways or from the motor vehicle fees fund, as the governor and council may from time to time determine. Any person sustaining injury or damage by any taking of land or rights of land under the provisions of this section shall have the same remedy therefor as in the case of the taking of land for highways.

Section 19. Said commission may contract with the city or town in which a state highway lies or with a private person or may make other provision for the maintenance and repair thereof in accordance with the regulations of said commission, and subject to its supervision and approval. Such contracts may be made without previous advertisement.

Section 20. Whenever a grade crossing is abolished upon a state highway, county way, or way which has been petitioned for as a state highway, the said highway or way shall be so constructed that there shall be a clear view in each direction for at least 150 ft. from the center of the said highway or other way where the same passes over or under the railroad or railway, unless the proposed plan for the abolition of the grade crossing is approved by the Massachusetts Highway Commission.

Section 21. Said commission shall annually, in January, certify to the treasurer and receiver-general the amount of expenditures for repair of state highways in each city and town during the preceding year. One-half the amount of such expenditures, not exceeding $50 a mile in towns with a valuation of less than $1,000,000, and not exceeding $100 a mile in towns with a valuation of $1,000,000 and less than $2,000,000, not exceeding $200 a mile in towns with a valuation of $2,000,000 and less than $5,000,000, and in cities and towns with a valuation of over $5,000,000 the said one-half of such expenditures, not exceeding $2,000 a mile in the aggregate and not exceeding $500 a mile in any one year, shall be made a part of the state tax for such cities and towns, respectively, and any balance due may be made a part of the state tax in the succeeding three years; but when such expenditures exceed $1,000 a mile in any one year on any particular mile of road, the amount to be collected on account of such expenditures shall be computed only for the number of miles actually so improved. Said expenditures shall include all moneys expended for the above purpose from whatever source received, and when collected shall be available for use for repair and maintenance of state highways in addition to any other money that may be available therefor. If a city or town elects to make such repairs upon terms and prices agreed upon by it and said commission and under the direction of said commission, the commission shall repay to it, from the annual appropriation for state highways, the amount expended therefor in excess of the amount which such city or town is required to repay under this section.

Section 22. The commission, upon application of the selectmen of any town, in which there is a state highway, that such town may be relieved from the payment of any part of the expenditures for the repair of state highways, may, if satisfied that such application should be granted, certify to the treasurer and receiver-general that such town should not be required to pay any part of the expenditures for repair of state highways; and thereupon there shall not be included as a part of the state tax for such town, for the year in which the certificate is made, any part of the expenditures for the repair of state highways.

Section 23. The commission shall allot for and expend in such towns the valuation of which does not exceed $1,000,000, and in such amounts as it determines, 5% of the amount appropriated each year for the construction of state highways, to be used in constructing and repairing ways in such towns; and it shall not be a condition precedent that such towns shall make any appropriation or contribution in excess of the usual annual appropriations for highway purposes to become eligible for an expenditure under this section. Said commission may also allot for and expend in such towns for like purposes, in addition to any expenditures hereinbefore provided for, a further amount of 5% of said amount appropriated, if such towns appropriate or contribute, to be expended under the provisions of this section, an amount equal to the amount allotted by the commission. Said commission may also allot and expend a further amount of not more than 5% of said amount appropriated each year for the construction of state highways in towns the valuation of which exceeds $1,000,000, in such amounts as it determines, if such towns appropriate or contribute, to be expended under the provisions of this section, an amount, in addition to the average annual appropriation for repairs of highways in such towns for the preceding five years, exclusive of appropriations or contributions under this section, equal to the amount allotted by said commission. No town the valuation of which is less than $1,000,000, and which makes no appropriation or contribution under the provisions of this section, shall receive in any one year more than 40% of its average

(Continued on page 116.)

GOOD ROADS

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

SEPTEMBER 1, 1917

SELECTING THE TYPE OF PAVEMENT

Not because it suggests any innovations in procedure but because it emphasizes well-known though frequently neglected principles, "The Selection of Pavements," by W. A. McLean, is given space elsewhere in this issue.

The arguments against selection by owners of abutting property—or by other laymen—have been set forth many times in these columns. With equal frequency it has been urged that this matter be left to engineers. It is distinctly an engineering problem and, as such, one to be solved by engineers.

Among the factors listed by Mr. McLean as determining the choice is one to which too little attention is paid even by engineers. That one is the availability of local materials.

Always a matter to be given the most careful attention in order to perform the work in hand in the most economical manner possible, it is of especial importance under existing conditions. Due to a variety of causes, chief of which is doubtless the war, with its attendant disturbance of supplies of all kinds, there has been an enormous increase in the cost of materials and labor. In addition, there is, in some cases, great difficulty with shipments. These circumstances combine to complicate the problems of the road builder and to make imperative the exercise of all the ingenuity he possesses to keep the cost of work within bounds.

While recognition of the value of the materials at hand is growing, there are still cases in which road building materials are needlessly imported, thus adding to the cost of work the freight charges and at least one additional handling charge. There are few localities in which there is an absolute lack of material with which to build roads, and even inferior material may often be employed with satisfactory results if a little extra care is exercised in the work of construction.

Local materials may often give less satisfactory results than better materials brought to the work from a distant source of supply. On the other hand, they will frequently give as good results as the imported material, taking into consideration the relative costs.

SAFE ROADS AS WELL AS GOOD ROADS

Every day adds force to the pleas for the building of roads that will meet the requirement of safety as well as provide highways otherwise suited to modern traffic conditions. The roads are public property for the use of all, and the users have a right to the greatest measure of protection that can be given them.

In the days before the automobile made its appearance, safety was one of the minor considerations. Comparatively slow moving horse-drawn vehicles, bicyclists and pedestrians were not greatly endangered by sharp turns, steep grades and inadequate bridge structures. Wooden or light steel bridges, comparatively sharp curves and what would now be considered excessive grades, were usual. Light guard rails were about the only safeguards found on the average country road.

Traffic conditions are now altogether different. The horse-drawn vehicle has been largely superseded by the pleasure automobile and the motor truck, and the total volume of traffic has greatly increased. The change from horse-drawn to motor-driven vehicles has brought heavier loads and an enormous increase in the speed of traffic. All these developments have made dangerous the roads that were formerly safe.

The guad rail must still be provided, but it must be made stronger. Bridges must be strengthened. Curves must be flattened and grades must be reduced, the latter not for ease of traction but for safety.

The greatest modification necessary in the design of roads is that in regard to alignment. To operate a motor car with an assurance of reasonable safety, the driver must be able to see the road for a considerable distance ahead—technically, the sight-line must be of sufficient length to permit turning out soon enough for safety or to give sufficient distance in which to bring a car to a full stop if necessary. A sight-line of only 100 ft. was formerly not uncommon on country roads and, indeed, can be found on many such roads today. While that distance would be ample for horse-drawn traffic, it is entirely too short for the safe operation of motor cars. Speeds of 35 to 40 mi. an hour are by no means excessive on properly designed roads and there are numerous drivers who do not hesitate to take turns at 25 mi. an hour. Two cars driven at that speed approaching a turn with a sight-line of only 100 ft. would be visible from each other for less than two seconds before they met.

The grade crossing danger is also greater than under former conditions. Pedestrians are more likely to be injured, especially in cities and towns, and the condition of the road surface is more of a menace to traffic.

Safety is one of the prime requisites of modern highway construction and no design that fails to provide all possible safeguards can be considered good.

The Missouri State Highway Department is making an exhaustive inquiry into the subject of convict labor on public roads. This is intended for the enlightenment of the public as to the manner in which the problem is handled in other states.

That Automobilists in West Virginia should also be rapid calculators is implied in an opinion by the Attorney General of the state on the law relating to speed in a closely built up section, on a bridge, dam, summit of a hill, steep descent, street intersection, railroad crossing or curve, which provides that it shall not be greater "than will permit of bringing the vehicle to a full stop in one-half the distance that the road is in full view, the objective point being construed as the distance viewed."

Tests of Concrete Road Aggregates

(*Continued from page 110*)

when a soft stone is used the mortar also should be weak so that both should wear equally.

On North Laredo Street, in the same city, a trap rock concrete has been in use for something less than two years. The proportion of the concrete was 1:2:4, the stone being the same trap rock as that used in the laboratory tests, except that it was graded from ¼ in. to 2 in. The condition of the surface of the street, however, brings out the similarity of the wear with that of the laboratory specimens. The mortar is wearing rapidly away from the stones, leaving them protruding from the surface. The large size stone used aided this result considerably, it is believed.

A crossing for pedestrians on a fairly heavy traffic street in Austin, Texas, is a gravel concrete in which the flints protrude, while the limestone pebbles have worn equally with the mortar. The gravel in the section was the same as that in specimen No. 2821, but the proportion of the mortar is not known to the writer.

While the above are the only examples at hand illustrating the actual wear of concrete roads, the writer has been informed of many others which bring out the various points shown by the laboratory tests.

Conclusion

The two most important essentials for a satisfactory road are, first, uniformity of wear; second, a minimum of wear. Whenever these two are combined with a high tensile strength the most satisfactory concrete road is found.

The conclusions drawn from these tests are as follows:

1. The uniformity of wear is obtained when the mortar and the coarse aggregate wear equally, such as when crushed limestone or limestone gravel is used.
2. The coarse aggregate should be limited in size to about 1½ in.
3. When hard, tough stone is used the size should be limited to about 1 in. and the cement content increased.
4. It is questionable if a richer mix than a 1:2:4 is an economical one to use with crushed limestone of the ordinary hardness. Crushed slag when hard and uniform should be satisfactory as a concrete road aggregate.
5. In a 1:2:4 concrete, a gravel composed of very hard stones such as flint, or quartz, does not wear uniformly.
6. The action of the cubical shot on the test specimens is a trifle more severe than the traffic on the road.
7. It cannot be said that either the crushed stone or gravel tested is superior as an aggregate to produce concrete having a higher tensile strength.

Texas State Highway Department Organized

The organization of the new Texas State Highway Department has recently been completed. In dividing the department into different bureaus the advice of A. L. Luedke, Highway Engineer of the United States Office of Public Roads and Rural Engineering, was sought and followed.

The department is to consist of two bureaus—a Bureau of Engineering, of which George A. Duren, the State Highway Engineer, is to be the head; and a Bureau of Registrations, Records and Accounts, of which D. E. Colp, Secretary, is to be the head.

The Bureau of Engineering is further divided into a division of roads, a division of bridges, and a division of tests. The division of roads will handle the road construction and maintenance problems. The division of bridges will handle the designing and construction of all bridges. The division of tests will handle the testing of all materials entering into road and bridge construction. The central engineering office will be in charge of an office engineer who will also handle the assignment of surveyors and draftsmen and the filing and recording of house data with reference to engineering work.

The inspection of construction work will be carried on under six state divisions, each division in charge of a division engineer who will be assisted by assistant engineers and such clerical help as may be necessary. The resident engineers will be in charge of the various projects in each division.

The function of the resident engineer, or the engineer in charge of the project under the division engineer, may be assigned to the county engineer when mutually agreeable to the Commissioners' Court and to the State Highway Department, as long as the county engineer reports to and is amenable to the State Highway Department. The county engineer will prepare a county map and make location surveys, plans and profiles, estimates of cost, etc., in any case where mutually satisfactory to the County Commissioners' Court and to the State Highway Department, in which case such engineering expenses are to be paid by the county out of funds due the county from the returns of the motor registration fees.

The Bureau of Registrations, Records and Accounts is divided into two divisions—the division of records and accounts, in charge of the chief clerk, and the division of registration of motor vehicles, of whch the registration clerk is the head.

The division of records and accounts will handle all clerical work, purchases, auditing, bookkeeping and filing.

In the division of registration, the registration clerk is assisted by the rate clerk and checkers, the cashier, arrangers, numberers, typers, certificate clerks and shipping clerk.

The organization as outlined in the organization plans is not perfected, but as the construction program is executed, additional men will be placed according to the outlines, as may be required by the amount of work under construction.

The Bureau of Registrations is at present making the collections and awarding number plates and seals of motor vehicle registration for the six months ending December 31, 1917. It is estimated that approximately 200,000 motor vehicles will be registered by this department. As organized at present the department is handling about 3,500 registrations daily.

The offices of the Texas State Highway Department are temporarily located on the second floor of the Capitol Building, pending changes in the capitol and the selection of a suite of rooms suitable to the needs of the department.

Due to the fact that the commission was appointed at a very late date, organization could not be effected at first to accommodate the great flood of applications for motor vehicle licenses, but the department is now operating and will soon be able to complete its work. The first shipment of number plates, consisting of 8,000 pairs, has arrived and all seals have been received and are now being distributed.

◆

A Scenic Driveway around the head of Happy Hollow affording a view of Minnehaha Falls is proposed as a feature of the plan for the Sibley Memorial Highway in Minneapolis, Minn.

The New Greenville-Henderson-Asheville Highway in North Carolina was formally opened on Aug. 11, with a celebration in which more than a thousand motorists took part. The road will be open to travel throughout the year; it has no grade over 7%.

Road Overseers in Missouri are required to cut all weeds and brush growing on the right of way of public highways. The State Highway Department has called attention to the neglect of this duty in many sections. It also points out that the roads, many of them too narrow, are made safer for travel by the removal of weeds, and that the work should be done before the seeds ripen.

The Selection of Pavements*

By W. A. McLEAN†

There is no "best" material or pavement uniformly adapted to all conditions. The best pavement or road is one which is best suited to the traffic to which it is subjected; which is best laid; and which is chosen with a view to local conditions. A granite block pavement on concrete foundation is the acme of strength and durability, but is utter extravagance on the side street of a village, where a cheap macadam or gravel would suit every need; the best of pavements can be spoiled by using poor materials and inferior workmanship; and stone concrete, using material brought in by rail, would rarely be considered good judgment if a gravel concrete pavement, using good local material, could be laid for half the cost. The best pavement is one which gives satisfactory service at least cost—the cost not being first cost alone, but cost after a term of years.

The general treatment of a street, and the type of pavement to be laid on it, should depend on varying requirements and conditions, such as:

(a) The size and wealth of the town or city.
(b) The amount and class of traffic on the street.
(c) The class of street, whether business, residential, etc.
(d) Local materials available for road construction.

Size and Wealth

Large cities have greater scope for choice in the matter of pavements than have smaller cities and towns. Wealth is concentrated in large cities, property values are high, and the cost of a pavement is a minor consideration as compared with service. Also, where the amount of paving is great, it is possible to install extensive plants for laying and maintaining certain kinds of pavements, which are impossible in smaller communities. Thus, the use of granite block pavements on heavy concrete foundations is largely confined to wholesale districts or heavily traveled thoroughfares of large cities —subject to the traffic of heavily loaded drays and trucks, and where a quiet pavement is not imperative. In the same way, the extensive plant required to construct and maintain sheet asphalt confines the use of that material to the larger cities.

Traffic

The amount and class of traffic on a street is an important factor in the selection of a pavement. While roads and pavements disintegrate to some extent by mere exposure to weather, yet the chief cause of destruction is wear under traffic. Many country roads, particularly the main arteries radiating from important towns and cities, carry much more traffic than some city streets. The number of vehicles passing certain points in large cities is very great; thus a 12-hour census of traffic showed over 3,400 vehicles per hour passing Hyde Park Corner in London, England. At the other extreme, some side streets of cities do not carry a dozen vehicles per day, and these only private carriages or delivery wagons. The main county roads adjacent to Toronto have shown a traffic of from 500 to 800 vehicles in 10 hours. A traffic of from 100 to 200 vehicles per day is more common adjacent to the smaller cities. To the latter traffic main streets of most villages and towns in Ontario may safely be adjusted.

The growing use of heavy motor trucks is creating a new situation with respect to traffic. The frequent passing of light vehicles causes surface wear; but heavy vehicles shatter the road foundations, particularly when used in the spring, when snow is melting and frost is leaving the ground; or in the autumn when the soil is softened after continuous rain. Heavy motor vehicles or heavy vehicles of any kind create a greater need for deep foundations to distribute the wheel load over a greater area of sub-soil.

Class of Street

Town and city streets may be divided into several well-defined classes:

(1) Streets of the business section, on which front stores and offices.

(2) Main thoroughfares carrying traffic in and out of the town or to the railway stations, and on which traffic converges.

(3) Important residential streets, not main thoroughfares.

(4) Residential or "side" streets of secondary importance.

The class of street affects the choice and design of a pavement. In a business section, sidewalks are laid to the street line, and the pavement should ordinarily be laid from walk to walk. A pavement is needed which standing horses cannot tear up, and which can be kept clean and free from dust. On a purely residential street, the roadway may be narrowed, the sidewalks may be narrow; sod and trees and a quiet pavement are desirable. On a main thoroughfare, carrying traffic to a station or leading to the country, a wider roadway is needed, and one resistant to wear. Some pavements, such as those of granite block or paving brick are noisy, and are objectionable on residential streets. Some, such as bituminous surfaces or concrete, are more easily kept clean than others, and are therefore suitable for retail business blocks; while a limestone macadam, unless oiled, is essentially dusty.

Local Materials

Local materials should be used as far as practicable to avoid heavy freight charges, and extra cost of handling from the railway cars. Trap rock is a hard, tough stone for road surfaces, and limestone is soft, and susceptible to wear. But it will generally be more economical to use a local limestone, and treat it with oil, rather than to import the more durable trap rock by rail. In this the amount of traffic is a factor, and under conditions of heavy traffic, trap rock may be the cheaper in a term of years. Local deposits of gravel may be used in various ways, commencing with the gravel roadway for light traffic, and—if the gravel is suitable—for heavier traffic, oiling it, treating it with asphalt or tar, or using it in the construction of a concrete pavement. The type of surface can be adapted in many ways to the local materials available.

The County Board of Douglas County, Nebraska, recently let a contract to the Omaha Structural Iron Works for the reconstruction and repair of 27 bridges at an aggregate cost of $60,000.

Joy Riders in Mountain Passes in Colorado are to have their licenses revoked bv the state, according to report. Violations of speed laws will be reported to the authorities by patrolmen on the mountain roads.

The Borough of Eddystone, Delaware County, Pa., recently passed an ordinance to increase the indebtedness of the Borough $35,000 for paying the cost of grading, paving, repaving and improving streets and issuing bonds therefor.

Road District No. 1 in Perry County, Arksansas, was organized on Aug. 8 for the purpose of constructing 35 mi. of improved highways, at a cost of $87,500. A portion of the Mammoth Spring to Hot Springs Road is included in the mileage to be built. It is expected that bids for the work will be asked within the next few weeks. The commissioners appointed for the district are D. M. Wallace, J. T. Chaflin, and A. F. Leigh.

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*From "Report on Street Improvement, Ontario, 1917," an appendix to the annual report of the Department of Public Highways of Ontario.

†Deputy Minister of Highways, Province of Ontario.

Massachusetts State Road Laws Codified

(*Continued from page* 112.)

annual appropriations for highway purposes for the preceding five years; provided, however, that said commission may allot in any year a sum not exceeding $400 to any such town, the said average annual appropriation of which does not exceed $1,000. Such allotments and expenditures shall be made only upon the petition of the selectmen of the towns and the provisions of Section 13 of Part 1 of this act shall apply thereto, but a way constructed or repaired under the provisions of this section shall not thereby become a state highway.

Section 24. The commission may, whenever any money is appropriated by the general court for the use of said commission in the construction or improvement of any particular road or roads, expend such money in constructing or improving the whole or such part or parts of said road or roads as it shall deem best, either upon the location of the existing roads or upon any new routes or relocations that may be laid out by the county commissioners of the county or the selectmen of the town in which said road or roads are situated, and no part of the road or roads so improved shall thereby become a state highway or be maintained as such. The commission may, however, in its discretion lay out the whole or any part of any such road as a state highway.

Section 25. When any county, city or town way has been constructed or improved in whole, or in part, with money furnished by the commonwealth, and the way is not laid out as a state highway it shall thereafter be the duty of the county, city or town in which the way lies to keep and maintain that part of the way which has been so improved at all times in good repair and condition. The commission shall notify the county commissioners of the county, the mayor of the city or the selectmen of the town (whichever has charge of the repairs of said way) in which any such way is situated whenever, in its opinion, such way is not being maintained in proper condition, and shall specify in said notice what repairs or improvements are necessary, and the county or municipal officials in charge of the way shall forthwith proceed to make the specified repairs and improvements. If said officials do not make said repairs or improvements within 60 days, or within such further time as the commission may allow, the commission may proceed to have the repairs or improvements made, and may pay for the same from any money which may be available for the repair or maintenance of state highways or from the motor vehicle fees fund available for through routes in towns, and shall certify the amount of such expenditures to the treasurer and receiver-general, to be collected by him in the same manner in which the expenses of repairs on state highways are collected under the provisions of Section 21 of Part 1 of this act. The money so collected may be used by said commission from time to time for the same purposes for which the money so expended was available, or for the repair and maintenance of state highways; provided, however, that in towns whose valuation is less than $1,000,000, not more than $50 a mile, and in towns of over $1,000,000 but under $2,000,000 valuation not more than $100 a mile, and in towns of over $2,000,000 valuation, not more than $200 a mile shall be collected in any one year, but any balance due may be certified and collected in succeeding years, but not exceeding three years on any one improvement, the maximum amount collectable in any one year being as above stated. The commission may, upon petition, exempt any county, city or town from the whole or any part of said payment, if in its judgment said payment would prove an undue burden.

Section 26. Said commission shall construct and maintain such portion of a state highway as lies between the lines of the sidewalks nearest to the center of the way. The sidewalks of said way may be constructed and maintained in accordance with the provisions of Sections 42 and 43 of Chapter 49 of the Revised Laws.

Section 27. Steam road rollers and other road machinery, purchased by the commission and owned by the commonwealth, shall be managed and maintained under the direction of said commission, which may engage competent engineers and mechanics to operate and keep said machines in repair, may purchase all needed materials and supplies, and may incur such other expenses as may be necessary to operate, maintain and transport said machines. Upon the application of the selectmen or road commissioners of a town of not more than 12,000 inhabitants, said commission may furnish such road machinery for use by the town in building or repairing ways therein. The expenses incurred under the provisions of this section shall be paid by the towns using said machines, as apportioned and directed by the commission.

Section 28. No length of possession, or occupancy of land within the limits of a state highway, by an owner or occupant of adjoining land shall give him any title thereto, and any fences, buildings or other obstructions encroaching upon a state highway shall, upon written notice by said commission, be removed forthwith by the owner or occupant of adjoining land, and if not so removed said commission may cause the same to be removed upon said adjoining land.

Section 29. No state highway shall be dug up, nor opening made therein for the laying or placing of pipes, sewers, poles, wires or railways or for other purposes, and no tree shall be planted or removed or obstruction or structure placed thereon or removed therefrom or changed without the written permit of the highway commission, and then only in accordance with the regulations of the commission; and the work shall be done under the supervision and to the satisfaction of the commission, and the entire expense of replacing the highway in as good condition as before shall be paid by the persons to whom the permit was given or by whom the work was done; but a city or town may dig up such state highway without the approval of the highway commission in case of immediate necessity; but in such cases it shall forthwith be replaced in as good condition as before at the expense of the city or town.

State Road Funds and Their Disposition in Lake County, Utah

The Board of County Commissioners of Salt Lake County, Utah, has authorized the county treasurer to issue short-term county notes in the sum of $22,000 to meet the county's portion of the cost of proposed state road work. The notes will anticipate the year's tax returns and will mature Dec 10, 1917.

It is stated that a total of about $71,000 will be raised in the county this year for state road purposes. Included in the work to be done in and near Salt Lake City are the following: Paving Beck St., $18,770; paving W. 14th St., South, $22,500; improving road in Parley's Canyon, $9,000.

Road Contracts to Be Awarded in Ohio

Proposals for a large amount of road work will be received by State Highway Commissioner Clinton Cowen at Columbus, O., on Friday, Sept. 7. The work is mostly construction, but there are also included a few contracts for maintenance and repair. Unless otherwise noted, all work includes grading and the construction of bridges and culverts, in addition to the laying of pavements. The counties and townships in which the construction work will be done, the character of the pavement, and the estimated cost of each improvement are as follows:

Adams County, Wayne Township, water bound macadam, $9,211.50; Adams County, Meigs Township, water bound macadam, $8,500.24; Ashtabula County, Monroe Township, monolithic brick, $114,655.81, or concrete, $100,033.31; Butler County, Lemon Township, monolithic brick, $75,964.15, or reinforced concrete, $67,934.75; Butler County, Lemon Township, monolithic brick, 81,874.95, or reinforced concrete, $71,624.85; Franklin County, Clinton Township, brick, $10,355.87; Crawford County, Jefferson Township, brick, $55,247.35; Delaware County, Delaware Township, reinforced concrete, $60,121.91, or bituminous concrete, $63,847.61, or bituminous macadam, $41,530.01; Green County, Caesar Creek Township, water bound macadam, $56,652.79; Guernsey County, Spencer Township, bituminous macadam, $22,370.48; Hancock County, Liberty Township, reinforced concrete, $27,304.92, or brick, $37,417.33, or bituminous concrete, $31,718,67; Highland County, Liberty Township, bituminous macadam, $22,729.84; Highland County, Dodson Township, water bound macadam, $11,743.83; Jackson County, Lick, Coal and Liberty Townships, water bound and bituminous macadam, $18,166.35; Knox County, Monroe Township, reinforced concrete, $46,389.58; Lake County, Willoughby Township, reinforced concrete, $36,498.21; Lawrence County, Upper Township, bituminous macadam (Tar T-1), $15,213.70, or bituminous macadam (Asphalt A-1), $15,683.05, or bituminous macadam (Asphalt A-1-c), $16,152.40; Lawrence County, Union Township, concrete, $20,026.75, or bituminous macadam (Tar T-1), $17,779.80, or bituminous macadam (Asphalt A-1), $18,300.10, or bituminous macadam (Asphalt

(A-1-C), $18,770.00; Madison County, Deer Creek and Union Townships, water bound macadam, $51,657.03, or bituminous macadam, $51,563.44, or reinforced concrete, $51,707.54, or monolithic brick, $51,550.70; Mahoning County, Jackson Township, water bound macadam, $12,146.60; Mahoning County, Austintown Township, brick, $26,120.85; Medina County, Brunswick Township, monolithic brick, $21,327.88; Mercer County, Marion Township, concrete, $31,210.03; Monroe County, Ohio Township, grading and drainage structures only, $15,166.38; Muskingum County, Newton Township, bituminous macadam, $15,183.48; Pickaway County, Walnut Township, water bound macadam, $24,109.27; Portage County, Edinburg Township, concrete, $46,932.43, or bituminous macadam, $42,618.56, or monolithic brick, $59,656.12; Preble County, Gasper Township, bituminous macadam, $8,147.90; Ottawa County, Salem Township, brick, $12,111.08; Ross County, Green Township, semi-monolithic brick, $15,810.76, and (a second contract) semi-monolithic brick, $28,848.83; Shelby County, Loramie Township, brick, $31,814.41, or monolithic brick, $24,495.10, or reinforced concrete, $24,061.30; Stark County, Marlboro Township, bituminous macadam, limestone or slag top, $54,571.07; Summit County, Norton and Franklin Townships, brick, $54,979.60; Summit County, Springfield Township, brick, $64,501.07; Union County, Paris Township, water bound macadam, $35,800.55; Vinton County, Vinton Township, brick, $7,925.60; Warren County, Harlan Township, water bound macadam, $3,793.70; Washington County, Warren Township, plain and reinforced concrete, $25,132.80; Wayne County, Baughman, East Union, Sugar Creek and Green Townships, monolithic brick, $50,339.08, or bituminous macadam, $45,771.48, or bituminous concrete, $58,989.39; Wayne County, Wooster Township, monolithic brick, $22,076.06, and (a second contract) monolithic brick, $15,081.00.

The following contracts will be awarded for maintenance and repair work:

Allen County, Bath Township, water bound macadam, $28,542.75, Ottawa County, Bay Township, brick, $54,486.32; Scioto County, Clay Township, brick, $25,022.89.

Federal Aid Projects in Nebraska Approved

The counties of Dakota, Wayne, Madison, Colfax, Burt, Cuming, Otoe, Seward, Saunders, Kimball, Gage, Sarpy and Johnson, in Nebraska, have submitted plans for federal aid highway work, and these have been approved by the State Board of Irrigation, Highways and Drainage.

Applications for state aid have been approved for five bridges, located as follows: Near Bartley, on the Republican River, $10,000; at North Platte, over the south channel of the Platte River, $20,000; in Knox County, across the mouth of the Verdigris River, $7,000; near Scottsbluff, across the North Platte, $20,000; at West Point, across the Elkhorn, $6,000.

Funds for Road Work in Illinois

Allotments of the state and federal funds available to July 1, 1920, have been made by the Illinois Department of Public Works and Buildings, according to a recent report. The total funds are available as follows: $1,326,000, July 1, 1917; $1,326,000, July 1, 1918; $1,765,000, July 1, 1919, and $2,209,000, July 1, 1920.

Allotments have been made as follows: $1,413,000 to the National Old Trails Road from the Indiana state line to East St. Louis; $1,020,000 to the Lincoln Highway between Chicago and Fulton; $2,215,000 to the Chicago-Springfield Road; $958,000 to the Springfield-East St. Louis Road; $614,000 to the Dixie Highway between Chicago and Danville, and $400,000 to the road from Chicago to the Wisconsin line.

It is estimated that the amounts allotted will take care of two-thirds of the total cost of the work, the counties being expected to furnish the remainder.

Advertising Signs on Missouri Roads

The new road law of Missouri provides that all advertising signs must be removed from trees growing along the public road. The law directs all road overseers to remove these signs, and also directs the county highway engineer to see that the law is enforced. This method of placing the responsibility is expected to secure a strict compliance with the law.

Limon Road and Other Highways in Colorado to be Improved

The recent appropriation of $45,000 by the State Highway Commission, added to the same amount contributed by the counties of Colorado, will provide for the improvement of a number of roads in the state within the next few months.

Eighteen thousand dollars will be spent on the Limon Road, the expense being divided 50% to the state, and 25% each to Elbert and Adams Counties, in which the road is located. The improvement which is now under way includes contracts for three concrete bridges at an additional cost of $7,100. The automobile highway between Denver and Colorado Springs, in Douglas County, will receive the benefit of an expenditure of $6,000 by the state and a similar amount by the county.

The amounts of state appropriation on account of other roads are: Independence Pass Road, Twin Lakes to Aspen, $1,000; Lake County, $1,000; Wolf Creek Pass, Mineral County, $1,500; Custer County, $1,500; Larimer County, $2,500; Coal Creek Road, Denver to Rollinsville, $2,000; Delta County, $1,000; Las Animas County, $2,000; Gunnison County, $2,500; Montrose County, $2,500; Lyons-Estes Park Road, Boulder County, $2,000.

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The County Court of Ripley County, Mo., has authorized an election on a $200,000 road bond issue on October 2.

The City Council of Pawtucket, R. I., has voted $25,000 for street work. The money is to be used for repair work during the current year.

Grading on the Columbia River Highway in Hood River County, Ore., has been commenced. The road will pass through the center of the Town of Hood River.

Good Roads Days in Alabama were observed on Tuesday and Wednesday, August 14 and 15. These dates are observed annually in accordance with a state law passed a few years ago.

Work on the Chestnut Ridge Road Between Lockport and McNall's, New York, is in progress, and it is expected that the 5-mi. section will be completed this fall. E. C. Beck, of Warren, Pa., is the contractor.

The Voters of Dallas County, Texas, defeated a proposed $1,000,000 road bond issue on August 21. The bond issue was carried by a majority of about 400 in the City of Dallas, but was defeated in the county precincts.

A Road Building Program for Wyandotte County, Kan., recently proposed by County Highway Engineer O. K. Williamson, provides for the construction of 16 mi. of brick roads and 23 mi. of macadam roads during the next four years.

The Texas State Highway Commission has designated as Highway Route No. 3 a road about 200 mi. in length connecting Houston and San Antonio. The road parallels the Galveston, Harrisburg & San Antonio R. R., and passes through Sugar Land, Richmond, Rosenberg, Eagle Lake, Columbus, Weimar, Schulenberg, Flatonia, Harwood, Waelder and Seguin.

The Construction of a Road From Cumberland, Md., to Hot Springs, Va., is being urged by residents of the section through which it would extend. A meeting to further the project was held recently at Moorefield, W. Va., and was attended by representatives of various counties in Maryland, Virginia and West Virginia. The proposed road would follow the valley of the South Branch of the Potomac River and, it is stated, would greatly shorten the route between the two places.

MEETINGS

Calendar of Coming Meetings

Sept. 5-8.—League of American Municipalities.—Annual convention, Gary, Ind. Secretary, Robert E. Lee, City Hall, Baltimore, Md.

Sept. 11-13.—American Association of Park Superintendents.—Annual convention, St. Louis, Mo. Secretary, Roland W. Cotterill, 533 City Hall, Seattle, Wash

Sept. 18-20.—League of Iowa Municipalities.—Annual convention, Iowa City, Ia. Secretary, Frank G. Pierce, Marshalltown, Ia.

Sept 18-20.—League of Virginia Municipalities.—Annual convention, Lynchburg, Va. Secretary, L. C. Brinson, Portsmouth, Va.

Sept. 24-29.—League of California Municipalities.—Annual convention, Santa Rosa, Cal. Secretary, Wm. J. Locke, Pacific Building, San Francisco, Cal.

Oct. 9-12.—League of Kansas Municipalities.—Annual convention, Wichita, Kan. Secretary C. H. Talbot, University of Kansas, Lawrence, Kan.

Oct. 17-18.—League of Minnesota Municipalities.—Fifth annual convention, St. Cloud, Minn. Secretary-Treasurer, Richard R. Price, University of Minnesota, Minneapolis.

Nov. 19-24.—City Managers' Association.—Annual meeting, Detroit, Mich. Secretary, W. L. Miller, City Manager, St. Augustine, Fla.

Nov. 21-24.—National Municipal League.—Twenty-third annual meeting, Hotel Statler, Detroit, Mich. Secretary, Clinton R. Woodruff, 703 North American Building, Philadelphia, Pa.

Jan. 15-17, 1918.—Virginia Good Roads Association.—Seventh annual convention, Richmond, Va. Secretary, O. B. Scott, Richmond, Va.

PERSONAL NOTES

William Wippermann has resigned as City Manager of Bryan, Tex., to enter an officers' training camp.

William D. Rishel, of Salt Lake City, Utah, has been elected secretary of the Utah Better Roads Association.

W. B. Reed has been appointed City Manager of Portsmouth, Va., for a three-year term. He was formerly Assistant City Engineer of Roanoke, Va.

T. R. Swiss, City Engineer of Vicksburg, Miss, has accepted a commisson in the Engineer Officers' Reserve Corps. It is expected that he will be reinstated after the close of the war.

F. M. Ringeley has been made manager of the Bartholow-Willits Engineering Co., succeeding Geo. D. Willits, who, as noted in a previous issue, has been appointed City Engineer of Galveston, Texas.

H. Walter Leavitt has been appointed Testing Engineer for the Maine State Highway Commission, succeeding E. D. Kingman. Mr. Leavitt was recently employed by the U. S. Office of Public Roads and Rural Engineer as Student Assistant Testing Engineer. The testing laboratories of which he now has charge are located at the University of Maine, Orono, Me.

W. E. Dozier has resigned as City Manager of Taylor, Tex., his resignation taking effect September 1.

L. E. Ayres, of the Consulting Board for the Belle Isle Bridge at Detroit, Mich., has resigned to become Principal Assistant Engineer with Gardner S. Williams, a consulting engineer of Ann Arbor, Mich.

James C. Nagle, C. E., Chairman of the Texas Board of Water Engineers, has been appointed Dean of Engineering and Professor of Civil Engineering at the Agricultural and Mechanical College of Texas, succeeding D. W. Spence, deceased. Professor Nagle was Professor of Civil Engineering at the Texas Agricultural and Mechanical College for about twenty years, and in 1911 was also made Dean of Engineering. He resigned in 1913 to become chairman of the Texas Board of Water Engineers. Professor Nagle is a past president of the Texas Association of Members of the American Society of Civil Engineers, a past president of the Texas Academy of Science, and a major in the Engineers' Reserve Corps.

NEWS NOTES

The Replacing of the Old Toll Bridge at Trenton, Mount Desert Island, Maine, with a new structure is under consideration by highway officials, according to report. A new bridge, it is estimated, would cost $125,000.

Street Accidents in New York City During July numbered 2,461, an increase of about 100 over the month of June. Records of the Traffic Court indicate that this summer will show an increase in the number of such accidents.

A Paved Highway Between Columbia and Camp Jackson, S. C., is under construction. It is 4 mi. in length. The work is being directed by W. L. Spoon, Engineer of the United States Office of Public Roads and Rural Engineering.

The Commercial Club of Omaha, Neb., has received reports from one hundred cities in various parts of the country to the effect that a large proportion of their paving troubles resulted from the use of the streets by heavy motor trucks.

Roadside Stands on Main Automobile Highways are recommended as a means of marketing farm produce, by the Worcester County, Mass., Farm Bureau. "Fresh Farm Products for Sale 300 Feet Ahead" is suggested for a sign to attract the attention of passersby.

The County Commissioners of Richmond County, Georgia, recently purchased three 3½-ton Kelly-Springfield Motor trucks for use in road work. These, with the two machines already owned, will give the county road officials a fleet of five motor trucks for use in county road work.

The Movement for An All-Resort Driveway in Cape May County, New Jersey, is strengthened by the announcement by the State Highway Commission that funds will shortly be available for building the road from Wildwood Crest through Two-Mile Beach to Cold Spring Inlet.

The Boston Neck Road Between Hamilton and Saunderstown, R. I., is to be reconstructed for a distance of 1.5 mi. Contract for the work has been let to John Bristow, of Narragansett Pier, on a bid of $33,830.80. The bid of Alfred Price, of Wakefield, was $33,732.50. Other bidders were Charles S. Towle, of Wakefield, $40,996.00; T. J. Quinn, Ashton, $39,161.70: Joseph McCormick, East Providence, $35,756.60; Amos D. Bridges' Sons, Inc., Hazardville, Conn., $35,101.50.

Citizens Residing Along Inter-County Seat Highways in Missouri are requested by the State Highway Board to report failures on the part of road drag commissioners to have their roads properly dragged or otherwise improved, for which an appropriation of $15 per mi. per year has been made from the state road fund for every mile of inter-county seat road in Missouri. Eleven thousand miles of these roads have already been approved as inter-county seat roads, but in come cases, it is reported that the money for a special road has been used elsewhere.

GOOD ROADS

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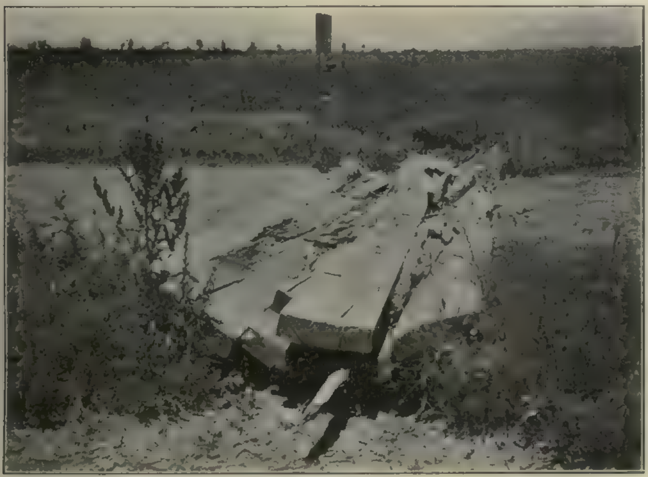
Culverts, Good and Bad

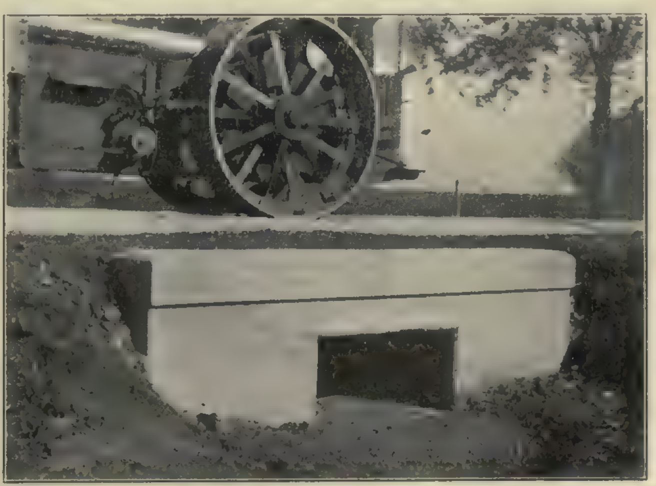
Genius was once defined as the capacity for taking infinite pains. Whether or not that is a correct definition of a rare quality, it is certain that attention to detail is often the secret of success in large undertakings and it is equally sure that failure to give proper attention to little things, things that appear unimportant, is very often a cause of failure.

Culverts are among the "little" things in road building; they may seem relatively unimportant, though they are actually of the utmost importance.

The common type of sulvert not so many years ago was of wood, built either as a box or as a wooden bridge of very short span resting on wood or stone abutments or walls. It was usually covered with a layer of earth only a few inches in depth. Maintenance and repair were omitted oftener than not and the culvert left until its condition was as shown in the illustration at the left, when it was rebuilt.



Worn-Out Wooden Box Culvert.



Well-Built Concrete Culvert.

CONTRASTS IN CULVERT TYPES.

In modern road work the principal types of culvert are pipes of metal, clay or concrete, box culverts of concrete, and stone structures. The latter are used comparatively seldom, so that pipe culverts and plain or reinforced concrete structures of the box or other simple types are the prevailing kinds.

The function of the culvert is to take water away from the road or to carry the road across a watercourse too small to require a bridge. The former is the more common and is the one considered here.

Providing a road with culverts comprises location, selection of type, design, and construction, all but the last named being properly tasks for the engineer and the engineer alone. The location will depend upon the layout of the road, the character of the soil, the topography of the adjacent land and the rainfall. The end to keep in view is to get the water off the road and away from it as soon as possible. Naturally this should be done at the least cost; cost meaning not only first cost but also upkeep cost. This factor must be given due weight in locating as well as in the next step, selection of type, in which it is of the greatest moment.

In selecting the type of structure best adapted to existing conditions various factors besides cost should be considered. Included in these are size of opening, head room, character of the road, and the availability of materials. The latter should be noted separately, for although it is really included in the item of cost, it is often overlooked in the consideration of that factor. As a rule no one of these several items will alone determine the type, but, as in other road building problems, they must be considered together and a decision reached by a careful study of them all.

The type having been selected the design must be made keeping in mind the limitations of the material chosen. Ease and, consequently, cheapness of construction must be taken into account and the future of the road must be considered. Another matter that should be given some attention is that of appearance. Too little attention is given this in all road work.

In the accompanying illustrations are shown two culverts —striking contrasts in this particular detail of road construction and maintenance. The illustration at the left is typical of conditions on so-called unimproved roads. The culvert could never have been satisfactory, for it must have had little or no cover and must have been an obstruction from the day it was put in. If it was like many others of its type it was probably poorly located, of insufficient size and carelessly built.

The culvert shown in the right-hand illustration is representative of one of the improved type that is rapidly replacing the old wooden boxes. It is properly located, well designed and properly built. It serves its purpose, does not obstruct the roadway and adds to the appearance of the road. It should require little care beyond an occasional cleaning out, and, in the end, will cost less than a culvert cheaper in first cost but less durable.

While this happens to be of concrete, a most satisfactory material for such structures, it does not follow that all good culverts must be of that material. As already noted, pipes of various kinds can be used when conditions call for them. Stone or concrete headwalls can and should be provided and careful work should be done in laying and covering.

If located, designed and built with skill and good judgment the drainage structures—in a road constitute a large part of the really permanent part of the work. Too much attention can not be given to them, for the money used to provide them is invested wisely.

Road Building in Michigan[*]

By FRANK F. ROGERS[†]

Seventeen years ago this summer Hon. Horatio S. Earle, then serving as chief council of the Michigan Division of the League of American Wheelmen, called an international road convention at Port Huron, the occasion being the completion of a mile of sample macadam road built under the auspices of the Office of Public Roads of Washington, D. C., of which Hon. Martin Dodge was the director. At that time two "horseless carriages"—they hardly dared call them automobiles—reached Port Huron with considerable difficulty, not so much due to bad roads as to the uncertainty of whether these machines would go or not when one attempted to start them.

Most of the leading officers and politicians of the state were invited to this meeting, but few at that time dared to be counted among the good roads advocates. The majority of the people were saying: "Nobody wants good roads but the bicyclists."

In 1905, Mr. Earle then serving the first year of his term as state highway commissioner, called another convention at Port Huron to again demonstrate macadam road building as it was being carried on by Port Huron Township. [The third annual convention of the American Road Builders' Association—then the American Road Makers' Association. —Ed.] In the brief space of five years sentiment was so changed that every state officer and politician who was invited felt it his duty to be there if possible and be counted on the side of good roads.

The State Highway Department was organized July 1, 1905, and consisted of the state highway commissioner, his deputy, and a stenographer. An appropriation was made by the legislature of 1905 which allowed $20,000 for the payment of state rewards and $10,000 for departmental expenses. After much effort and the holding of many meetings, the department succeeded in inducing the people to build 18 mi. of road, but it did not require much more than half of the appropriation to pay the rewards.

But times have changed and with them the sentiment of the people. Nobody longer questions the fact that improved roads are a good investment for the farmer, the merchant and everyone who has occasion to use the public highways whether it be by motor car or horse-drawn vehicle.

The trunk line act, passed by the 1913 Legislture, provided that in addition to paying double rewards on trunk lines, the state should design, build and maintain all the bridges on the trunk line highways, provided the township, road district or county built 3 mi. of trunk line road, including the bridge. Under this provision, during the past four years, the state has built and repaired bridges at an aggregate cost of $391,614.51.

To show how widespread this road movement is, it may be noted that applications for state reward have been received from every county but one, Montmorency, and that roads have been completed and rewards paid in 77 of the 83 counties of the state, there being 5 counties with roads under construction but not yet completed.

The total rewards paid up to June 30, 1917, amounted to $4,528,532, and if to this we add the money paid as repair rewards and for trunk line bridges, we have a grand total paid by the state for the construction and maintenance of roads and bridges, over and above departmental expenses, of $5,034,978.05.

The following table shows the miles of roads built and the dollars paid in state rewards by fiscal years:

1906	18.1	mi	$13,675
1907	64.4	"	51,701
1908	96.4	"	71,729
1909	162.2	"	117,021
1910	204.4	"	137,327
1911	304.2	"	193,876
1912	382.6	"	249,671
1913	522.0	"	329,392
1914	682.3	"	581,736
1915	759.8	"	783,566
1916	744.6	"	757,532
1917	1,052.8	"	1,241,306
Total	4,993.8	"	$4,528,532

In addition to the rewards paid as above noted, the state has expended $114,831.54 for road maintenance, paid out as repair reward on state rewarded roads which have been maintained in a manner satisfactory to the state.

There are 16 counties in which the state has more than one hundred miles of state reward roads, and they are here mentioned in the order of the miles built as follows: Genesee, 228; Saginaw, 188; Wayne, 174; Tuscola, 168; Calhoun, 167; Huron, 164; Gratiot, 157; Berrien, 134; Eaton, 126; Kalamazoo, 118; Kent, 118; Oakland, 115; Shiawassee, 114; Mecosta, 107; Jackson, 105; Wexford, 102.

Nine counties have received more than $100,000 each in state rewards. These, in order of amounts received are as follows: Wayne, $267,796; Saginaw, $199,843; Delta, $160,610, Genesee, $135,103; Tuscola, $117,960; Huron, $117,280; Calhoun, $116,943; Oakland, $116,301; Bay, $100,308.

Six townships have built within their borders more than 20 mi. of road. They are as follows: Elkland, Tuscola County, 23.44 mi.; Pine River, Gratiot County, 23.27 mi.; Wells, Delta County, 21.31 mi (part of this was built by the county); Windsor, Huron County, 20.44 mi.; Sand Beach, Huron County, 20.44 mi., and Mancelona, Antrim County, 20.14 mi.

Michigan has been frequently criticised for building a disconnected system of roads scattered over the entire state instead of concentrating on and building a few trunk lines, as many of the eastern states have done. Indeed, 5,000 mi. of road scattered over 77 counties attract but little attention. We hardly realize that Michigan has enough miles of improved roads to go more than three times around its entire coast line along the Great Lakes or to make more that fifteen lines of continuous roads from the Ohio line to the Straits of Mackinaw. With automobiles so generally distributed, an increasingly large number of our citizens desire to go from town to town and from one part of the state to another, and there is now a real demand that we connect these gaps in the trunk lines and make the roads continuous as speedily as possible.

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[*] Address at the Michigan Good Roads Field Day, Cass City, Mich., Aug. 24, 1917.

[†] State Highway Commissioner of Michigan.

The trunk line law enacted by the 1913 Legislature calls for the building of 4,786 mi. of road, about one-fourth of which is now completed. More than another fourth is applied for, so that it may now be said that less than one-half of the entire trunk line system still remains to be provided for.

In 1916, the federal government made an appropriation with which to assist in the improvement of the public wagon roads of the nation. This money is divided among the states, one-third according to population, one-third according to area and one-third according to post road mileage. Michigan's share of this allotment is $2,186,755, of which $473,351.16 is now available, namely the allotment for the 1917 and 1918 fiscal years.

Project statements have been forwarded to the federal government for approval, covering almost this entire allotment. Two of the projects have already been approved, two have been rejected on account of not being sufficiently covered by post roads, and three more are still under consideration by the Department of Agriculture.

In accordance with the suggestion of the Secretary of Agriculture and the Office of Public Roads at Washington, it is the intention of your commissioner to use this money as far as possible in connecting the gaps in the state trunk line system provided by the Legislature of 1913 and approved by the various townships and counties of the state. If there is no interruption in this program, we have reason to believe that before the present federal aid appropriation is exhausted, Michigan will have a complete system of roads, with every city, village and hamlet connected with every other city, village and hamlet, so that the farmer moving his crops to market and the citizen going for business or pleasure may find good, hard, smooth and well-kept roads covering the entire distance he desires to travel.

The Commerical Vehicle Problem in England

The readjustment of license tariffs for omnibuses and other commercial motor vehicles to meet the expense of reconstructing road surfaces to carry their increasing weight, and the additional cost of maintenance, is occupying the attention of lawmakers everywhere, and is a subject of country-wide concern. A perfectly natural reasoning would place the burden of this enormous expenditure upon the shoulders of those who are directly responsible for the operation of passenger and freight carrying cars, taking into consideration also the advantages which the industry automatically yields to others.

An analysis of highway and street traffic is being attempted in many states in one form or another, looking toward a solution of the problem of type of construction and the maintenance of roads since this new transportation industry has rendered them of greater and greater importance.

An example of the thorough study which is being given to the question is revealed in a report made upon request by County Surveyor H. T. Chapman, of Kent County, England, to the County Council, which was reviewed at length in a recent number of "The Surveyor and Municipal and County Engineer," of London, England. Mr. Chapman prefaced his report by referring to certain acts which govern the use of every type of motor vehicle up to a maximum weight of 5 tons, unloaded, for privately owned vehicles, or 6 tons, unloaded, for heavy military motor cars.

Asserting that speed is probably the chief factor to be dealt with in relation to the wear and tear of roads, he then gave the existing speed limits. In the case of motor cars and motorcycles not exceeding 2 tons in weight, unladen, the maximum lawful speed is 20 mi. per hour, except in districts having a speed limit order made by the local government, while heavy motor cars are restricted to a maximum speed ranging from 5 mi. an hour in the case of vehicles drawing a trailer or not having soft or elastic tires; to 12 mi. an hour for a vehicle having soft or elastic tires and not having a registered axle-weight on any one axle in excess of 6 tons. Those having a registered axle weight exceeding 6 tons are restricted to a maximum speed of 8 mi. an hour. Power is reserved to proceed against a driver for the dangerous driving of any class of motor vehicle, although the actual speed at which it is driven may be below the maximum fixed by the regulations.

Recommending that before new omnibus routes may be established, which is done by consent of the highway authorities, omnibus owners be required to agree to bear a proportion of the additional cost of upkeep of the roads affected, the scale of such contributions which was approved by the Kent County Council in February was given. This is as follows:

1. The payment by each proprietor of £10 per route-mile per annum, payable in advance quarterly or otherwise, such payments to be deducted from any amounts that may be due under the following mileage rates should they exceed this minimum payment.
2. The contribution in respect of all water bound macadam roads, tar painted or otherwise, to be at the rate of 1d. per 'bus mile.
3. The contribution in respect of all tar-macadam or other bituminous bound surfaces to be at the rate of 3/4d. per 'bus mile.
4. The contribution in respect of all roads having concrete foundations to be at the rate of 3/8d per 'bus mile.

The number of heavy motor vehicles registered in the county is not stated in the report, as many of such vehicles using the Kent County roads are licensed in London and in other counties.

What follows is taken from the body of the report:

"Kent main roads, like those in other home counties, carry an enormous number of heavy motors as distinct from motor omnibuses, and goods, merchandise, foodstuffs, and other commodities are carried not only to places bordering on and in London, but from one place to another, and from one end of the county to the other. Although the wear and tear and damage to the roads is consequently exceedingly heavy, it must be borne in mind that cheap and expeditious transit benefits both the producer and manufacturer as well as the purchaser and consumer, and these are largely Kent ratepayers.

"It is a moot point as to which of these should bear the greater burden of maintaining the roads which are of benefit to all, and it is almost impossible equitably to allocate the cost without instituting a wheel tax as in the old turnpike days.

"Of our 600 mi. of directly maintained main roads about 314 mi. carry motor omnibus services, and of the 150 mi. of borough and urban main roads 104 mi. are used for the same purpose. The services vary from five minutes on some roads to two or four journeys per day on others.

"Generally speaking, motor omnibuses serve a public need, and have come to be considered a necessity. Apart from the railway services, which in Kent are admittedly not of the best, there are many places not served by railways, or so badly served that a long, tortuous and tedious journey by rail would be experienced in getting from place to place in the county.

"In the towns of Bromley, Folkestone, Hythe, Tunbridge Wells, etc., the fact that there are very frequent local motor bus services proves they are a public requirement, otherwise the companies, not being philanthropists, would not run them. Again there is no doubt that the services inaugurated by the various motor bus companies to places of interest are an asset to pleasure resorts in the county and a distinct attraction to visitors.

"The damage done to our main roads by motor omnibus traffic is one of the most serious problems the county council have to contend with in the maintenance and repair of the main roads, as the wear and tear caused by this traffic is enormous. Most of the routes were never constructed or built up to carry this damaging type of traffic, and they must be reconstructed, strengthened and resurfaced in a more suitable manner if they are to withstand it and be kept in adequate condition for this and other traffic using them. Many of the roads, such as the Maidstone to Chatham, Maidstone to Sittingbourne, Maidstone to Tonbridge, and others, prior to the motor bus era, could be, and were maintained in water bound granite macadam of even flint, and kept in good condition at small cost compared with the present expenditure, but have since had to be strengthened and surfaced with bituminously bound material at not less than double the former cost.

"Anyone traveling over roads that have not recently been specially surfaced can tell at once that they are passing over a 'bus route' by the waviness, corrugations and deep holes caused by the vibrating and abrading action of quick, heavy traffic. Very many miles of main roads in rural and urban areas have been or are in course of, or must shortly be, strengthened and resurfaced with more suitable and costly material to meet this class of traffic, and the cost to the ratepayers is ever an increasing one. The damage is general throughout the county.

"Experience has proved that to withstand intense and frequent motor bus traffic nothing short of wood or granite sett paving or asphalt on a concrete foundation costing something like 12s. 6d. per sq. yd. (pre-war prices) is required, and in the metropolitan boroughs it has been found necessary to increase the concrete foundations from 6 in. to 9 in., or even 12 in. in thickness, or to reinforce them.

"On the main roads in the Borough of Bromley and urban district of Penge, where wood paving has been laid on motor bus routes, a thickness of 9 in. of concrete was provided.

"For moderate motor bus traffic, possibly bituminous surfacing in lieu of water bound granite would suffice, provided always the foundation is adequate; this would cost about 5s. per sq. yd. against, say 2s. per sq. yd. for granite macadam, or £2,500 per mi. for the former and £1,000 per mi. for the latter.

"To surface all our directly maintained main roads carrying motor bus services not already surfaced with bituminous material would cost something like £500,000. There is, however, additional cost to be faced. The action of quick traffic on roads with inadequate foundations or weak sides on clay sub-soils, as in Kent, causes great distortion and movement in the road crust, and I estimate that from £40,000 to £50,000 is required for strengthening the main roads and forming lateral support. This, in addition to the aforementioned figure, makes a total expenditure of £550,000 to cope with this and other heavy traffic.

"Instances can be given of reconstruction and surfacing work done and required on urban main roads, forming motor bus routes as at Bromley and Penge, wood paving on concrete; Folkstone, Hythe and Tunbridge Wells and other towns, surfacing with slag tar-macadam. Possibly some £200,000 would be required to bring the urban roads up to a suitable standard to withstand the traffic, or a grand total expenditure on all county main roads of about £750,000.

"It might in passing be well to refer to the damage caused to buildings adjoining or abutting on roads carrying motor bus services, as many complaints have been received from property owners and tenants of the damage, inconvenience and nuisance ensuing from this traffic.

"It is manifest that owners of motor vehicles cannot be expected to bear the whole burden of the expenditure necessitated in making the roads suitable to withstand their traffic in addition to other traffic requirements, without penalizing them to such an extent as unduly to hamper industries and increase the cost of transit or traveling on the roads.

"It is, however, undoubtedly true that the present rate of contribution towards highway expenditure is in no way commensurate with the advantages reaped financially and otherwise by the provision of good roads. The King's highway is open to all to use but not to abuse, and it must be remembered that tramway undertakings and light railway companies have first to obtain Parliamentary sanction before using roads, and in addition have to provide and maintain tracks, the initial cost of which may be at the rate of £3,000 per mile; also rates must be paid to local authorities to assist, among other things, in maintaining the roads over which motor buses may be running in competition. Again, railway companies with which commercial motors and commercial buses are in competition are heavily rated, and, in fact, in many parishes are the heaviest ratepayers."

In concluding his report, Mr. Chapman expressed the belief that the laws of 1896 and 1903 required the amendment of their provisions relating to the construction, speed, registration and licensing of heavy motor vehicles. He argued that "more adequate rates of contribution from heavy and high-speed traffic" should be secured for road construction, maintenance and repair, and that highway authorities should be given more control over the routes to be used by heavy motor vehicles.

Public Hearings on Routes of New Jersey State Highway System

The public hearings which have been held by the State Highway Commission of New Jersey for the purpose of determining the most feasible routes to be included in the highway system of the state will close with meetings that have been scheduled for September and October. The dates and places of the hearings are as follows:

Sept. 27, 2:00 p. m., Cape May Hotel, Cape May City; Route No. 15, Bridgeton to Cape May court house, or point on Route No. 14. Oct. 11, 2:00 p. m., State House, Trenton; Routes Nos. 1 and 2, Elizabeth to Trenton, and Trenton to Camden. Oct. 18, 11:00 a. m., Court House, Freehold; Route No. 7, Hightstown to Asbury Park. Oct. 25, 2:00 p. m., Court House, Hackensack; Routes Nos. 10 and 11, Paterson to Fort Lee Ferry, and Newark to Paterson.

The chairman and members of the State Highway Commission and its engineers will attend the hearings, which with those already held will form the basis of a report to the next legislature.

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A $2,500,000 Bond Issue for Jefferson County, Alabama, was recently proposed at a dinner given to returning "scouts" of the Bankhead National Highway, at the Civic Association Rooms, Birmingham, Ala.

Highway Department Directory

According to its custom "Good Roads" presents here the names of the principal officials, engineers and other members of the staffs of the highway departments of the several states and of the U. S. Office of Public Roads, the District of Columbia and the Territory of Alaska.

In general, the addresses of individuals, except division and resident engineers, are the same as that of the department with which they are connected. In some cases, however, other addresses should be used and these are given. All names and titles given have been taken from the lists carefully maintained by "Good Roads," but to make accuracy doubly sure these lists have been checked within the past few weeks. There have been many changes in officials during the past year and for that reason the subjoined directory should prove of more than usual value.

United States

Office of Public Roads and Rural Engineering, United States Department of Agriculture, Washington, D. C.:

Director, Logan Waller Page.

Chief Engineer, Highway Construction and Maintenance, P. St. Julien Wilson.

Chief of Management, Management and Engineering Economics, J. E. Pennbacker.

General Inspectors: Edwin W. James, T. Warren Allen.

Chief of Rural Engineering, E. B. McCormick.

Chief of Road Material Tests and Research, Prevost Hubbard.

Assistant Chief Engineer, A. E. Loder.

Assistant Engineer, V. M. Peirce.

Alabama

State Highway Commission, Montgomery: Chairman, Robert E. Spragins; John Craft; J. B. Rylance; Dr. Eugene A. Smith (State Geologist); G. N. Mitcham (Professor of Engineering, Alabama Polytechnic Institute).

State Highway Engineer, W. S. Keller; Assistant State Highway Engineer, J. B. Converse.

Chief Clerk, F. O. McManus.

Alaska

Board of Road Commissioners for Alaska, Juneau: President, Brig.-Gen. W. P. Richardson, Infantry, U. S. A.; Secretary and Disbursing Officer, Lieut.-Col. P. W. Davison, Infantry, U. S. A.; Engineer Officer, Captain J. C. Mehaffey, C. E., U. S. A.

Arizona

State Highway Department, Phoenix: State Engineer, Thomas Maddock; Office Engineer, T. F. Nichols; Chief Clerk, Andrew Baumert, Jr.

Division Engineers: E. A. Woolf, Clifton; J. C. Ryan, Bisbee; A. L. Harter, Phoenix; I. P. Fraizer, Nogales.

Arkansas

State Highway Commission, Little Rock: Chairman, Wm. B. Owen, Commissioner of State Lands, Highways and Improvements; Guy B. Tucker; R. R. Thompson; A. H. Glasscock, Deputy Commissioner of State Lands.

Secretary, Ben Spires.

State Highway Engineer, H. R. Carter; Principal Assistant, W. C. Hight.

California

State Highway Commission, Sacramento: Chairman, Newell D. Darlington; Charles F. Stern; Henry J. Widenmann.

Secretary, Wilson R. Ellis.

State Highway Engineer, Austin B. Fletcher; First Assistant Highway Engineer, George R. Winslow; Second Assistant Highway Engineer, Lester H. Gibson.

Advisory Board: Governor Wm. D. Stephens; Arthur Arlett, President, State Board of Harbor Commissioners; F. W. Hatch, General Superintendent of State Hospitals; W. F. McClure, State Engineer; and Messrs. Darlington, Stern and Widenmann of the Commission, appointed members.

Attorney, Charles C. Carleton; Purchasing Agent, R. C. Penter; Chief Accountant, John H. Small; Geologist, Clarence B. Osborne.

Division and Assistant Division Engineers: Division 1—F. G. Somner, Division Engineer F. W. Haselwood, Principal Assistant Engineer; Willits. Division 2—T. A. Bedford, Division Engineer; R. H. Stalnaker, Principal Assistant Engineer; H. S. Comly and S. S. Stahl, Assistant Division Engineers; Dunsmuir. Division 3—W. S. Caruthers, Division Engineer; T. E. Stanton, Jr., Assistant Division Engineer; Sacramento. Division 4—W. Lewis Clark, Division Engineer; George Mattis, Assistant Division Engineer; San Francisco. Division 5—W. C. Howe, Division Engineer; O. C. Tretten, Assistant Division Engineer; San Luis Obispo. Division 6—J. B. Woodson, Division Engineer; D. W. Chamberlin, Assistant Division Engineer; Fresno. Division 7—W. W. Patch, Division Engineer; S. V. Cortelyou and E. E. East, Assistant Division Engineers; Los Angeles.

Colorado

State Highway Commission, Denver: Chairman, J. M. Kuykendall; Vice Chairman, Leonard E. Curtis, Colorado Springs; Fred J. Radford, Trinidad; Frederick Goble, Silverton; L. Boyd Walbridge, Meeker.

State Highway Commissioner, T. J. Ehrhart.

Chief Engineer, J. E. Maloney.

Secretary, Alfred L. Ogle.

Connecticut

State Highway Commission, Hartford: State Highway Commissioner, Charles J. Bennett; Deputy Commissioner, Richard L. Saunders; Superintendent of Repairs, W. Leroy Ulrich; Assistant Superintendent of Repairs, D. R. Kane.

Division Engineers: Robert W. Stevens, Hartford; Elmer C. Welden, New Haven; W. Howard Sharp, Middletown; George E. Smith, New Milford; Robert S. Hulbert, Winsted; Arthur W. Bushell, Norwich.

Supervisors of Repairs: Jedediah Deming, Hartford; C. A. Nolan, West Willington; R. E. Donnelly, Bridgeport; B. A. Cooke, New Haven; E. P. O'Brien, Naugatuck; H. H. Davenport, Pomfret; M. F. Mulville, Norfolk; A. C. Innis, New Milford; H. T. Gorman, Norwich; W. E. Hulse, Middletown.

Delaware

State Highway Department, Dover: Commissioners: Chairman, Gov. John G. Townsend, Jr., Selbyville; Joseph E. Holland, Milford; Walter O. Hoffecker, Smyrna; Josiah Marvel, Greenville; Gen. Coleman DuPont, Wilmington.

Chief Engineer, Charles M. Upham.

Secretary, George W. Francis.

District of Columbia

Engineer Department, Washington: Engineer-Commissioner, Brig.-Gen. John G. S. Knight, U. S. A.

Surface Division: Assistant to Engineer-Commissioner in charge, Capt. J. J. Loving; Engineer of Highways, C. B. Hunt; Superintendent of Streets, H. N. Moss; Superintendent of Suburban Roads, L. R. Grabill; Engineer of Bridges, D. E. McComb; Superintendent of Street Cleaning,

J. W. Paxton; Inspector of Asphalt and Cements, J. O. Hargrove; Surveyor, M. C. Hazen; Superintendent of Trees and Parkings, Clifford Lanham.

Assistant Engineers: J. W. Dare, G. V. Rector, A. S. Fennell, W. W. Curtis, A. S. Fernald, E. G. Emack, O. B. Magruder, T. J. Powell, S. J. Gass.

Florida

State Road Department, Tallahassee: Chairman, Ed. Scott, Arcadia; Secretary, J. D. Smith, Marianna; M. M. Smith, Orlando; W. J. Hillman, Live Oak; F. O. Miller, Jacksonville.

State Road Commissioner, Wm. F. Cocke.

Chief Clerk and Assistant Secretary, J. P. Clarkson.

Georgia

State Highway Department, Atlanta: Chairman, T. E. Patterson, Griffin; R. E. Davidson, Woodville; E. L. Rainey, Dawson; S. W. McCallie, Atlanta; C. M. Strahan, Athens; R. D. Kneale, Atlanta.

Idaho

State Highway Commission, Boise; Chairman, W. A. Brodhead; E. A. Van Sicklin; Secretary, W. T. Dougharty, Secretary of State.

State Highway Engineer, E. M. Booth.

Illinois

Department of Public Works and Buildings, Springfield: Director, Leslie D. Puterbaugh; Assistant Director, Thos. H. Vennum.

Division of Highways: Board of Highway Advisors: Robert D. Clarke, Peoria; Col. Wm. G. Edens, Chicago; Homer J. Tice, Greenview; Joseph M. Page, Jerseyville; A. R. Hall, Danville.

Superintendent of Highways, S. E. Bradt.

Chief Highway Engineer, Wm. W. Marr.

Road Engineer, H. E. Bilger; Assistant Road Engineer, C. M. Hathaway; Bridge Engineer, Clifford Older; Assistant Bridge Engineer, G. F. Burch; Maintenance Engineer, B. H. Piepmeier; Assistant Maintenance Engineer, F. T. Sheets; Testing Engineer, F. L. Roman; Office Engineers: J. W. Harris, Bureau of Roads; N. L. Bunn, Bureau of Bridges; Chief Clerk, J. M. McCoy.

Division Engineers: H. B. Bushnell, Aurora; H. E. Surman, Moline; A. H. Hunter, Peoria; R. L. Bell, Paris; Fred Tarrant, Springfield; C. M. Slaymaker, East St. Louis; J. E. Huber, Mt. Vernon.

Indiana

State Highway Commission, Indianapolis: Chairman, L. H. Wright; Haines Egbert, Goshen; David C. Jenkins, Kokomo; Lewis Taylor, Newburg.

State Highway Engineer and Secretary, Wm. S. Moore; Assistant Engineer, Wm. H. Rights; Chief Clerk, Helen Norton Freeman.

Iowa

State Highway Commission, Ames: Chairman, H. C. Beard; J. W. Holden; A. Marston.

Chief Engineer, Thos. H. MacDonald.

Chief Clerk, F. W. Parrott.

Bridge Department: Bridge Engineer, J. H. Ames; Assistant Bridge Engineer, E. F. Kelley; Structural Engineer, E. W. Blumschein; Assistant Engineer, E. Williams; Consulting Bridge Engineer, J. E. Kirkham.

Road Department: Road Engineer, F. R. White; Assistant Road Engineers: J. S. Dodds, W. E. Jones; Assistant Engineers; L. S. Gates, F. H. Mann, H. S. Leicht, S. A. Schackle, A. S. Miller, P. F. Hopkins.

Drafting Department: Chief Draftsman, J. A. Paulsen.

District Engineers: C. Coykendall, Ames; W. H. Root, Mason City; W. F. Beard, Ames; L. M. Martin, Atlantic; J. S. Morrison, Ottumwa.

Drainage Department: Drainage Engineer, R. W. Clyde.

Tests and Experimental Department: Assistant Engineer, Bert Myers.

Kansas

State Highway Commission, Topeka; Chairman, Governor Arthur Capper; E. R. Moses, Great Bend; R. S. Tiernan, Fort Scott.

State Highway Engineer, W. S. Gearhart.

Road Engineer, M. W. Watson; Bridge Engineer, C. I. Felps.

Secretary, W. C. Markham.

Assistant Engineers: C. H. Scholer, O. M. Carter, W. J. Arnold, J. F. March.

Kentucky

Department of Public Roads, Frankfort: Commissioner of Public Roads, Rodman Wiley; Bridge Engineer, Chas. D. Snead; First Assistant Highway Engineer, F. L. Duffy; Chief Clerk, Joe M. Kendall; Accountant, L. O. Taylor.

Division Enginers: M. D. Ross, T. B. Webber, T. B. Smith, Shirley Cuniff, H. E. Read, L. L. Pearsall, W. L. McDyer, J. S. Dawson, W. S. Canning, L. D. Hollingsworth, W. N. Bosler.

Louisiana

Board of State Engineers, Highway Department, New Orleans: State Highway Engineer, Duncan Buie.

Assistant State Highway Engineer, W. F. Cooper; Engineer of Construction, L. T. Gilmer; Engineer of Maintenance, C. M. Kerr; Bridge and Office Engineer, C. G. Cappel.

Secretary, Chas. F. Wood; Assistant Secretary, Chas. Chauchon.

Resident Engineers: H. C. Daigre, Mansfield; W. H. Norckauer, Raceland; R. M. Irwin, Riverton; H. T. Richardson, Hammond; C. A. Spencer, Crowley; H. H. Holloway, Bunkie; L. J. Daigre, Winnfield; W. F. Duffy, Colfax; E. J. C. Burroughs, Monroe; L. B. Harris, Denham Springs; V. P. Guilfoux, New Orleans; John Brogan, Baton Rouge; W. T. Drew, Clayton; H. C. Erwin, Mansfield; J. H. Ellis, New Orleans.

Maine

State Highway Commission, Augusta: Chairman, Philip J. Deering, Portland; Wm. M. Ayer, Oakland; Frank A. Peabody, Houlton.

Chief Engineer, Paul D. Sargent.

Assistant Engineres: I. W. Barbour (in charge of state highways); L. D. Barrows (in charge of state aid); A. J. Wiggin (in charge of maintenance); L. B. Jones (in charge of bridges); G. F. H. Bragdon (draftsman).

Maryland

State Roads Commission, Baltimore: Chairman, F. H. Zouck; G. Clinton Uhl, Cumberland; John F. Mudd, Bryantown.

Chief Engineer: H. G. Shirley; First Assistant Engineer, B. P. Harrison.

Assistant to Chairman, John E. George; Office Manager, H. C. McAvoy.

Resident Engineers: R. W. Owens, Hyattsville; R. G. Browning, Chestertown; W. F. Childs, Jr., Salisbury; C. A. Tenney, Frederick; L. T. Downey, Cumberland; E. H. Wroe, Baltimore; Edwin Friese, Baltimore.

Massachusetts

Highway Commission, Boston: Chairman, Wm. D. Sohier; Frank D. Kemp; James W. Synan.

Secretary, Frank I. Bieler.

Chief Engineer, Arthur W. Dean; First Assistant Engineer, Andrew M. Lovis.

Division Engineers: C. H. Howes, Greenfield; J. A. Johnston, Springfield; F. C. Pillsbury, Boston; W. R. Farrington, Middleboro.

Engineer of Special Work, H. D. Phillips, Greenfield.

Michigan

State Highway Department, Lansing: State Highway Commissioner, Frank F. Rogers; Deputy State Highway Commissioner, Leroy C. Smith.

Bridge Engineer, C. V. Dewart; Assistant District Engineer, L. H. Belknap; Office Engineer, J. H. Dateman; Chief Draftsman, H. L. Brightman.

District Engineers: G. C. Dillman, Escanaba; L. H. Neilsen, Cadillac; William W. Cox, Kalamazoo; L. D. Townsend, Lansing; R. W. Roberts, Saginaw; E. K. Lovelace, Lansing; T. O. Williams, Grand Rapids.

Minnesota

State Highway Department, St. Paul: Commissioner of Highways, C. M. Babcock; Deputy Commissioner of Highways, J. H. Mullen.

Chief Bridge Engineer, C. E. Nagel.

Division Enginers: W. F. Rosenwald, St. Paul (First Assistant Road Engineer); R. K. Bliler, Bemidji; J. E. Ellison, St. Paul; M. J. Hoffman, St. Paul; C. W. Johnson, Red Wing; C. A. Forbes, St. Paul; C. L. Kipp, St. Paul.

Mississippi

State Highway Commission, Jackson: Chairman, J. M. McBeath, Meridian; D. W. Robbins, Tupelo; Secretary, W. T. Denman, McComb; State Highway Engineer. Xavier A. Kramer.

Missouri

State Highway Department, Jefferson City: State Highway Board: Chairman, E. L. Sanford, Springfield; Vice Chairman, George E. McIninch, St. Joseph; Secretary, A. C. McKibbin, Clayton; C. O. Raine, Canton.

State Highway Engineer, Alexander W. Graham.

Assistant Engineers: J. Russell Ellis, Columbia; J. P. Davis, Windsor.

Field Engineer, Kirk McFarland, St. Louis.

Chief Draftsman, Chester D. Mann.

Montana

State Highway Commission, Helena: F. H. Johnson, Kalispell; D. T. Curran, Missoula; C. H. Buford, Virginia City; Oscar Rohn, Butte; Frank Conley, Deer Lodge; H. A. Templeton, Great Falls; C. W. Morrison, Fort Benton; A. W. Mahon, Glasgow; Samuel Webb, Columbus; E. A. Richardson, Forsyth; H. R. Wells, Miles City; T. F. Hagen, Glendive.

Executive Committee: H. R. Wells, A. W. Mahon, Oscar Rohn.

State Bridge Engineer, Geo. R. Metlen.

State Highway Engineer, Paul D. Pratt.

Nebraska

State Board of Irrigation, Highways and Drainage, Lincoln: President, Governor Keith Neville; Attorney-General, Willis E. Reed; Commissioner of Public Lands and Buildings, Grant Shumway.

State Engineer and Secretary: Geo. E. Johnson; Assistant State Engineer, R. L. Cochran.

Nevada

Department of Highways, Board of Directors, Carson City: Chairman, W. B. Alexander, Reno; Geo. K. Edler, Reno; James M. Leonard, Virginia City.

State Highway Engineer, Robert K. West; Assistant State Highway Engineer, C. C. Cottrell.

New Hampshire

State Highway Department, Concord: State Highway Commissioner, F. E. Everett.

Office Engineer, J. W. Childs.

Chief Clerk, C. C. Howe.

Division Engineers: F. W. Brown, Concord; W. A. Grover, Dover; F. H. Colburn, Concord; H. L. Smith, Lakeport; C. M. Brooks, Keene; O. M. James, Northwood Narrows; C. P. Riford, Concord.

New Jersey

State Highway Commission, Trenton: Chairman, John W. Herbert, Helmetta; Anthony R. Kuser, Bernardsville; George W. F. Gaunt, Mullica Hill; Col. E. A. Stevens, Bernardsville; Watson G. Clark, Tenafly; Walter J. Buzby, Atlantic City; Ira A. Kip, Jr., South Orange; George E. Blakeslee, Jersey City.

State Engineer, Gen. George W. Goethals.

State Highway Engineer, R. A. Meeker.

Division Engineers: E. M. Vail, E. E. Reed, Roy Mullins.

Assistant Division Engineers: Harry D. Robbins, F. W. Tooker.

State Chemist, R. B. Gage; Assistant Chemist, Fred H. Baumann.

Chief Clerk, A. Lee Grover.

New Mexico

State Highway Commission, Santa Fe: President, Charles Springer; Secretary, E. Kempenich; W. M. Atkinson.

State Highway Engineer, James A. French; Assistant State Highway Engineer, L. J. Charles; Bridge Engineer, Frank Herrman; Chief Draftsman, B. C. Broome.

Chief Clerk, C. M. Wells; Disbursing Clerk, Ellis Bauer.

Division Engineers: J. C. Harvey; W. C. Davidson; C. B. Sampson.

New York

State Commission of Highways, Albany: State Commissioner of Highways, Edwin Duffey; First Deputy Commissioner, H. Eltinge Breed; Second Deputy Commissioner, Fred W. Sarr; Third Deputy Commissioner, Benjamin J. Rice.

Secretary, Irving J. Morris; Assistant Secretary, Frank R. Pennock.

Auditor, S. D. Gilbert.

Private Secretary to the Commissioner, James T. Taaffe.

Assistant to First Deputy Commissioner, E. A. Bonney; Secretary to Second Deputy Commissioner, R. W. Baker; Assistant to Third Deputy Commissioner, Fred Buck.

Senior Assistant Engineer, Mark W. Nelson.

Engineer of Bridges, Frank A. Hermans; Chief, Bureau of Tests, F. D. Burleigh; Chemist (in charge of the chemical testing of materials), Joseph E. Myers; Assistant Engineer (in charge of the physical testing of materials), H. S. Mattimore.

Chief Clerk, Harry P. Condon; Appointment Clerk, H. W. Cowlbeck.

Division Organization: Division No. 1, Poughkeepsie: Division Engineer, Bertrand H. Wait; Senior Assistant Engineers, E. J. Howe, John R. Kaley, Lowell Grossman. Division No. 2, Albany: Division Engineer, H. O. Schermerhorn; Senior Assistant Engineer, R. V. Collins. Division No. 3, Watertown: Division Engineer, Theron M. Ripley; Assistant Engineer, C. C. Cassel. Division No. 4, Utica: Division Engineer, James H. Sturdevant. Division No. 5, Binghamton: Division Engineer, Howard E. Smith; Senior Assistant Engineer, R. E. Miller. Division No. 6, Syracuse: Division Engineer, William M. Acheson; Senior Assistant Engineers, R. J. Marcher, J. H. Huber. Division No. 7, Rochester: Division Engineer, Perry Filkin; Senior Assistant Engineer, James E. Kelley. Division No. 8, Hornell: Division Engineer, Charles M. Edwards. Division No. 9, Buffalo: Division Engineer, Charles J. McDonough; Senior Assistant Engineers, T. J. Schoenlaub, George T. Keith, Charles T. Fisher.

North Carolina

State Highway Commission, Raleigh: Chairman, Governor T. W. Bickett; Secretary, Dr. Joseph Hyde Pratt, Chapel Hill; Bennchan Cameron, Stagville; T. F. Hickerson (Professor, University of North Carolina); W. C. Riddick (Professor, North Carolina Agricultural and Mechanical College); Guy V. Roberts, Marshall; E. C. Duncan.

State Highway Engineer, W. S. Fallis.

Highway Engineers: R. E. Snowden, Washington; R. P. Coble, Sanford; R. T. Brown, Lexington; Wythe M. Peyton, Raleigh; A. F. Brown, Roxboro; S. D. Scott, Goldsboro; S. B. Howard, Morganton; J. R. Williams, Waynesville.

Assistant Highway Engineers: R. W. McGeachy, Raleigh; W. G. Wilson, Mt. Gilead.

Bridge Engineer: Wm. L. Craven.

Testing Engineer, Ira B. Mullis.

North Dakota

State Highway Commission, Bismarck: Chairman, Governor Lynn J. Frazier; John N. Hagan, Commissioner of Agriculture and Labor; Edmund White, Mohall; Theo. Andrew, Mayville.

Chief Engineer and Secretary, State Engineer Jay W. Bliss.

Assistant State Engineers: P. W. Thomas (bridges); J. E. Kaulfuss (roads).

Chief Clerk, R. E. Schumann.

Ohio

State Highway Department, Columbus: State Highway Commissioner, Clinton Cowen.

Deputies; Chief Engineer, H. D. Bruning; A. H. Hinkle (Maintenance and Repairs); J. R. Chamberlin (Bridges).

Chief Clerk, H. L. Hastings.

Secretary, Marmion L. Freeman.

Division Engineers: D. W. Seitz, Harwood Lersch, E. C. Blosser, John W. Graham, R. N. Waid, T. T. Richards, W. G. Smith, E. W. Davis.

Engineers: Wm. S. Hindman, A. W. Smith, Glenn R. Logue, J. R. Burkey, Don O. Stone, Harry Neal, Harry J. Kirk, Chas. J. Ward, E. G. Campbell, R. M. Lee, R. C. Watts.

Testing Engineer, A. S. Rea; Assistant Testing Engineers: Howard Levering, A. B. Braden.

Oklahoma

Department of Highways, Oklahoma City: State Commissioner of Highways, George B. Noble.

State Engineer, Max L. Cunningham; Assistant State Engineer, W. P. Danford.

Chief Clerk, Nash Setzer.

Oregon

State Highway Commission, Salem: Chairman, S. Benson, Portland; W. L. Thompson, Pendleton; E. J. Adams, Eugene.

Secretary and Auditor, G. Ed. Ross.

Bridge Engineer, C. H. Pursell; Designing Engineer, L. W. Metzger; Office Engineer, S. H. Probert.

Assistant Engineers: W. E. Eddy, Portland; M. O. Bennett, Pendleton; C. C. Kelly, Roseburg.

Pennsylvania

State Highway Department, Harrisburg: State Highway Commissioner, ————.

First Deputy Commissioner (Acting State Highway Commissioner) Joseph W. Hunter (in charge of Bureau of Township Highways).

Second Deputy Commissioner, George H. Bliss (in charge of maintenance).

Chief Engineer, William D. Uhler.

Chief Clerk, Howard W. Fry.

Auditor, William R. Main.

Engineer, Bureau of Township Highways, W. A. Wynn; Office Engineer, J. A. Mackell; Engineer of Tests, Julius Adler; Bridge Engineer, Willis Whited; Engineer of Construction, P. M. Tebbs.

Registrar, Automobile Division, George M. Brusstar.

Chief Draftsman, George H. Elsenhans.

Statistician, H. R. Campbell.

Assistant Engineers: Wayne D. Meyers, Bellfonte; C. W. Hardt, Harrisburg; A. C. Clay, Bloomsburg; H. W. Claybaugh, Franklin; W. R. Wolfinger, Allentown; C. W. Erisman, York; W. F. Cressman, Philadelphia; F. E. Winter, DuBois; W. S. Hammaker, Chambersburg; J. S. Ritchey, Wellsboro; C. S. Lemon, Hollidaysburg; W. H. Bircher, Scranton; S. W. Jackson, Pittsburgh; C. E. Myers, Washington; T. C. Frame, Warren.

District Engineers, Bureau of Township Highways: H. A. Thomson, Harrisburg; Geo. L. Sollenberger, Harrisburg; R. B. Hamill, Pittsburgh; W. P. Miller, Warren; Harry G. Harper, Bloomsburg.

Rhode Island

State Board of Public Roads, Providence: Chairman, John F. Richmond; Secretary, Benjamin F. Robinson; Abram L. Atwood, Frank Cole, Michael Van Beuren.

Chief Engineer: Irving W. Patterson.

Chief Clerk, Peter J. Lannon.

South Carolina

State Highway Commission, Columbia: Chairman, J. Monroe Johnson, Marion; Professor M. Goode Homes, University of South Carolina, Columbia; Maj. Robert G. Thomas, Charleston; Professor Haile Houston, Clemson College; C. O. Hearon, Spartanburg.

State Highway Engineer, Capt. J. R. Pennell.

South Dakota

State Highway Commission, Pierre: Chairman, Governor Peter Norbeck; Secretary, State Engineer Homer M. Derr; Frank S. Peck, Deadwood.

Tennessee

State Department of Highways, Nashville: Commissioners: Arthur Crownover, Winchester; W. H. Crox, Cleveland; Chas. F. Williams, Paris; Governor Tom C. Rye; Chas. E. Ferris (Dean, Engineering Department, University of Tennessee, Knoxville); Dr. A. H. Purdue (State Geologist).

State Highway Engineer, A. M. Nelson.

Secretary, J. J. Murray.

Chief Clerk and Statistician, O. M. West.

Texas

State Highway Commission, Austin: Chairman, Curtis Hancock, Dallas; T. R. McLean, Mount Pleasant; H. C. Odle, Meridian.

State Highway Engineer, George A. Duren, Corsicana.

Secretary, D. E. Colp, Austin.

Utah

State Road Commission, Salt Lake City. Chairman, Governor Simon Bamberger; Vice Chairman, Secretary of State Harden Bennion; State Auditor Joseph Ririe; Attorney General Dan B. Shields; State Engineer George F. McGonagle.

Secretary and State Road Engineer, Ira R. Browning.

Assistant State Road Engineer, James O. Burson.

Vermont

State Highway Department, Montpelier: State Highway Commissioner, Stoddard B. Bates.

District Highway Commissioners: W. N. Cady, Middlebury; M. E. Carpenter, Charlotte; A. B. Cobleigh, West Derby; R. S. Currier, Barre; J. L. Davis, Manchester Center; F. L. Dudley, Randolph; M. C. Noyes, Sharon; D. T. Perry, Brattleboro; M. M. Stocker, Danville; G. G. Temple, Lunenburg; J. C. Towle, Enosburg Falls; C. F. Willis, Rutland.

Virginia

State Highway Commission, Richmond: State Highway Commissioner, George P. Coleman; Wm. M. Thornton, Dean, Engineering Department, University of Virginia; R. F. H. Begg, Professor of Civil Engineering, Virginia Polytechnic Institute; Col. T. A. Jones, Professor of Civil Engineering, Virginia Military Institute.

Assistant State Highway Commissioner, C. B. Scott; Assistant in Charge of Maintenance, S. L. von Gemmingen; Engineer of Construction, F. D. Henley; Bridge Engineer, W. R. Glidden; Assistant Maintenance Engineer, C. S. Mullen.

Auditor, D. McDonald.

Division Engineers: A. H. Pettigrew, Bristol; W. I. Lee, Lynchburg; E. R. Cocke, Richmond; S. C. Liggett, Gordonsville; S. J. Sadler, Fredericksburg; B. R. Cowherd, Jr., Norfolk.

Washington

State Highway Board, Olympia: Chairman, Governor Ernest Lister; Secretary and State Highway Commissioner, James Allen; W. W. Sherman, State Treasurer; C. W. Clausen, State Auditor; E. F. Blaine, Chairman, Public Service Commission.

State Highway Commissioner, James Allen; Assistant State Highway Commissioner, H. G. Porak.

Chief Engineer, Geo. F. Cotterill.

Right of Way Agent, Chas. L. Dufault.

Assistant Engineer: W. L. Bowen; H. J. Doolittle; R. M. Gillis; W. L. Goodwin; Charles Jordan; James A. Davis; E. R. Hoffman.

West Virginia

State Highway Commission, Charleston: Commissioner, A. Dennis Williams; Secretary-Treasurer, Tim S. Scanlon.

Bridge Engineer, Rolland P. Davis; Testing Engineer, Edward Bennett; Statistical Engineer, Robert Duncan; Chief Draftsman, L. L. Jamison.

Chief Clerk, Charles G. McCoy.

Division Engineers: C. E. Grafton, W. S. Downes, Blake Taylor, Cleo Swecker, Edwin St. C. Smith, P. J. Walsh, Geo. H. Hill, Burdette Woodyard.

Wisconsin

State Highway Commission, Madison: Chairman, John A. Hazelwood; Secretary, W. O. Hotchkiss; F. E. Turneaure; John S. Owen, Eau Claire; Fred Pabst, Oconomowoc.

State Highway Engineer, A. R. Hirst.

Assistant Engineer, H. J. Kuelling; Bridge Engineer, M. W. Torkelson; Assistant Bridge Engineer, B. E. Dodge; Engineer of Surveys, Gordon F. Daggett.

Chief Inspector, J. T. Donaghey.

Chief Clerk, Geo. C. Hank.

Division Engineers: F. M. Balsley, Madison; J. E. Gillespie, Milwaukee; W. M. Conway, Green Bay; F. F. Mengel, Grand Rapids; W. C. Beutow, La Crosse; S. P. Hall, Spooner; F. M. Sergeant, Rhinelander; G. H. Nickell, Eau Claire.

Assistant Engineers: Thos. E. Reilly, Madison; C. R. Weymouth, Milwaukee; A. E. Kringel, Grand Rapids; T. M. Reynolds, La Crosse; H. W. Vroman, Eau Claire; H. C. Nelson, Rhinelander; A. L. Hambrecht, Spooner.

Wyoming

State Highway Commission, Cheyenne: Chairman, Robert D. Carey, Careyhurst; Gus Holm's, Cody; F. C. Williams, Sheridan; Joe Kinney, Cokeville; M. R. Johnston, Wheatland.

State Highway Engineer: Z. E. Sevison.

Methods and Costs of Road and Street Work in Malaga, Spain

Probably the greatest difference between road construction in Spain and in the United States is that no road building machinery, except the road roller, is used in Spain, all the grading being done with picks and shovels, as a result of the cheapness of labor. The foregoing statement is contained in a report by United States Consul Louis G. Dreyfus, Jr., of Malaga, Spain, in a recent issue of the "Commerce Reports" of the U. S. Department of Commerce. He suggests that American manufacturers of graders and other road building machinery not made in Spain might be able to introduce their goods into that market. At present there are no contractors or business houses in Malaga which handle such machinery. Attention is called, however, to the law of Feb. 14, 1907, for the protection of Spanish national products, which prohibits foreign firms from submitting bids for any machinery of a kind that may be obtained in Spain. Steam rollers are manufactured in Spain, but no gasoline road rollers are made there.

Mr. Dreyfus states that for use on the state highways in the Province of Malaga which is situated in Southern Spain, there are three steam rollers of 15 tons each, and that two more, one of 10 and one of 15 tons, have been ordered from the manufacturer, the Campania Maquinista Terrestre y Maritima, of Barcelona. One 7-ton gasoline roller has been ordered from Barford & Perkins, Ltd., of England, at a price of 25,000 pesetas (peseta, present exchange, $0.235) or $5,875.

Commending the system of road maintenance used in Spain, he advises that the highways are divided into districts of 4 to 6 km. (2.5 to 3.7 mi.), and that in each of these districts there is a house owned by the state with tool room attached, where road laborers reside with their families. Every section has one or two laborers assigned to it, and it is their duty to work on the roads daily. The daily wage of the peon is 2 to 3 pesetas.

The highways of the Malaga district are of comparatively good macadam construction, similar to those in America. Outside of the city limits they are constructed and maintained by the government, under the supervision of the Engineer of Public Works, who is employed by the Minister of Development, the mileage of such roads being 870 km. (540.6 mi.). The width of the highways is 7 to 8 m. (22.97 and 26.25 ft.), over all, the road proper being 4½ and 5½ m. (14.76 and 18.05 ft., respectively). The maximum grades are from 8% to 9%.

Road building material is secured from various rock quarries in the province, and is broken by hand along the roadway. Calcareous spar is the principal variety, although the more resisting diorite and serpentine rocks are employed. After the road is properly graded, a trench is excavated and filled with crushed rock to a depth of 12 to 15 cm. (4.7 to 5.9 in.) on the sides, and 25 to 30 cm. (9.8 to 11.8 in.) in the center, giving the proper crown. The rock is then rolled, covered with a binder of sand and gravel, and again rolled.

About one mile of asphalt paving has been laid in the City of Malaga, and in a few instances Belgian blocks and macadam has been used. Several new streets are being paved with the blocks which can be laid for 13 pesetas per sq m. (1.196 sq. yd.), against 20 pesetas and more per sq. m. for the macadam. Most of the streets are in poor condition, and many are unpaved. Repairs are superficial, and the surfaces soon deteriorate. This is due in part to hauling which is done in carts without springs. The carts have two large wheels 5 ft. in diameter, the iron tires being sometimes only 3 in. wide. A law has been proposed to prohibit the use of narrow tires, but so far it has not been passed.

For Wider Roads in Maryland

An appropriation providing for the construction of shoulders on all improved highways, and those hereafter improved in the State of Maryland, will be asked by the State Roads Commission of the next General Assembly. It is reported that this movement is based on the demand for wider roads and the avoidance of accidents. Regulation of the use of heavy motor trucks will also be sought.

Federal Aid Roads in Buchanan County, Missouri

The tentative selection of highways to receive state and federal aid in Buchanan County, was accomplished at a recent meeting held at St. Joseph, Mo., at which members of the State Highway Department and a number of business men were present.

St. Joseph, which is a city of about 80,000 inhabitants, is situated at the crossing point of two transcontinental highways—the Pikes Peak Ocean to Ocean Highway and the Jefferson Highway. The roads proposed for federal and state aid all radiate from this city and comprise a total of 81.5 miles. They are the Jefferson Highway to Dearborn, 17.3 mi.; road to DeKalb, 14.2 mi., bottom road to Atchison, 21 mi.; road toward Savannah, 1.3 mi.; Pikes Peak Highway leading eastward via San Antonio, 11 mi.; road to Gower, 16.7 mi.

The question of types was also discussed, but is one to be decided only after available road building materials and the character of the country to be traversed by the roads have been investigated.

Three Thousand Miles of State Highway Under Improvement in Minnesota.

A recent announcement made by the State Highway Commissioner of Minnesota gives the mileage of state road under construction, being graded, as 2,000, while approximately 1,000 mi. are being surfaced with gravel. The funds available for state and federal road improvement amount to more than $5,000,000 this year, and it is planned to build a large permanent mileage next year. Six federal aid projects representing a mileage of 117 have been approved, and are as follows:

County	Miles	Federal Aid	Estimated Cost
Chisago	32	$55,000	$110,000
Freeborn	16	23,100	46,200
Pine	50	80,000	160,000
Sherburne	8	15,000	30,000
Washington	5	10,000	22,506
Winona	6	12,000	24,000

Federal specifications require that these roads be made 24 ft. wide, and all grade crossings thereon be eliminated. They also call for the use of 1,200 cu. yd. of gravel surfacing per mile.

A contract for surfacing the Chisago road project with gravel will be awarded on Sept. 14, the grading contract having been let on Aug. 15.

County levies for highway improvement this year show an increase in funds of 38.5% in 73 counties.

On Jan. 1, 1918, the funds derived from the new automobile tax of $5 per car will become available and will bring the state road fund to about $2,000,000, which with money to be received from the federal government will give the state $2,500,000 exclusive of county levies.

Bids on Pennsylvania Highway Work

Acting State Highway Commissioner Hunter opened bids at Harrisburg on Sept. 4 for the construction of improved roads in Fayette, Dauphin, Armstrong, Butler, McKean Montgomery, Cambria, Washington, Lehigh and Lackawanna Counties, Pennsylvania, and for grading and draining a stretch of road 9,299 ft. long in Beaver County. The various improvements with corresponding bids are as follows:

Cambria County: East Taylor Township, State Highway Route 52, Section 4-C, 9,878 ft. of vitrified block pavement; Manwaring & Cummins, Philadelphia, $94,817.70. Jackson and East Taylor Townships, Route 52, Section 4-B, 11,070 ft. of vitrified block pavement; Manwaring & Cummins, $117,522.30. Jackson Township, Route 52, Section 4-A, 11,975 ft. of vitrified block pavement; Manwaring & Cummins, $109,705.50, and John L. Elder, Ebensburg, $86,278.20.

Washington County: Cecil and North Strabane Townships, Route 108, Section 1, 19,318 ft. of vitrified block and reinforced concrete pavement; Peter F. Connolly, Elmira, N. Y., $162,335.10.

Allegheny County: South Fayette Township, State Highway Route 108, Section 1, 16,852 ft. of vitrified block and reinforced concrete pavement; Peter F. Connolly, $150,280.16.

Lehigh County: Hanover Township, State Highway Route 159, Section 1, 11,857 ft. of reinforced concrete construction; Manwaring & Cummins, $82,484.89, and J. C. Bentley, Elizabeth, N. J., $71,937.35.

Butler County: Clinton Township, Bureau of Township Highways Authorization No. 319, 5,800 ft. of vitrified block pavement; Norman J. Boyer, Butler, $42,486.75, and Duster Contracting Co., Tarentum, $38,867.59.

Lackawanna County: South Abington Township, State Highway Route No. 9, Section 1, 7,821 ft. of bituminous pavement; Parsons Construction Co., Inc., Scranton (Class "D"), $94,852.60; H. B. Sproul Construction Co., Inc., Peekskill, N. Y. (Class "D"), $51,218.60; Kennedy Contracting Co., Utica, N. Y. (Class "A"), $68,256.40; (Class "B"), $66,779.10; (Class "C"), $65,290.80; (Class "D"), $65,290.80; P. J. Boyle Construction Co., Wilkes-Barre (Class "D"), $61,723.40; Matthias Stipp & Sons, Scranton (Class "A"), $77,088.97; John J. Phillips, LaPlume, (Class "A"), $65,245.75.

Dauphin County: Swatara Township, State Aid Application No. 570, 1,270 ft. of vitrified block pavement; Stucker Brothers Construction Co., Harrisburg, $17,857.30, and F. J. Reilly, Lancaster, $18,184.20.

Beaver County: Moon and Hopewell Townships, State Aid Applications Nos. 252-259; W. S. Morrison, New Brighton, $18,849.50.

McKean County: Foster Township, State Highway Route 96, Section 1, 8,367 ft. of reinforced concrete pavement; Lawrence Schultz & Sons, Fredonia, N. Y., $43,777.00; Joseph McCormick & Bro., Erie, $48,116.20; Peter F. Connolly, Elmira, N. Y., $42,232.00.

Armstrong County: Manor Township, State Aid Application No. 397, 13,007 ft. of vitrified block pavement; Rinehardt Brothers, East Liverpool, Ohio, $132,020.10.

Fayette County: Washington Township, State Highway Route 247, Section 1, 6,513 ft. of vitrified block pavement; Vincenzo Di Giorno, Fayette City, $52,401.70.

Montgomery County: Abington Township, Upper Moreland and Upper Dublin Townships, State Aid Application No. 648, 6,537 ft. of reinforced concrete pavement; Manwaring & Cummins, $54,475.72.

No bids were received for the section advertised in East Bethlehem Township, Washington County, State Highway Route 268.

Commissioner Hunter announced that action on the bids would be given out later.

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

SEPTEMBER 8, 1917

ROAD BUILDERS AND THE WAR

When the war is over and its story has been told, it will be found that in bringing victory to the Allies the road builders of this country have done their share, and more.

And while many of them will fight "somewhere in France," and later—unless the war comes to a comparatively quick end—"somewhere in Germany," their labor and sacrifice in battle will by no means be the measure of their service.

What the work of building, repairing and maintaining roads means to a nation in times of peace need be urged but little upon readers of "Good Roads," nor, indeed, upon the American people as a whole. It is now pretty generally recognized that good roads bring material prosperity, intellectual progress and moral uplift. We have had it impressed upon us that land values rise with the transformation of "mud roads" into "365-day roads"; that the movement of the crops and other commodities is made impossible by impassable roads and made easier and easier, cheaper and cheaper, as the highways are made better and better; that standards of living become higher and higher as intercommunication is facilitated. We know that illiteracy retreats before the extension of good roads and the possibility of good schools everywhere that comes with them. We have seen farm life made more attractive by improved roads and we have witnessed an enormous increase in outdoor life through the agency of the automobile and the bettered roads that have made its use possible.

What good roads mean to a country at war, though not the scene of actual hostilities, we are beginning to realize and will appreciate more and more as the war continues. This phase has been touched on repeatedly in these columns during the past few months. Every peace-time need for roads is magnified in war time. We need roads for all the varied purposes we ever needed them and for new uses as well.

What roads mean in the theater of war we can guess but dimly nor will we know with certainty until we can collect and collate the observations of the men who have directed the operations in the present conflict. The writings of military men, the reports that have filtered through from "over there" and what we can read between the lines of what has been printed and written all point to an importance that we are not likely to overestimate.

Roads, good roads—in fact, even serviceable roads—can not be had without road builders. We have the road builders, frequent statements to the contrary notwithstanding, and we can depend upon them to do their duty, whether on the fields of Europe or on the plains and in the mountains of America. Those who will give up homes and employment to build and mend roads back of the trenches will serve well and nobly, perhaps making the supreme sacrifice by giving their lives that others may keep theirs. Those who stay here will also serve. Their portion of reward will not be like that of their former comrades, but no one can say that their work will count for less in the final reckoning.

HIGHWAY DEPARTMENT DIRECTORY

A directory of highway departments is given considerable space in this issue because it is felt that an authoritative list of names of this kind will be of very real use to a large number of our readers.

This list has been prepared with the utmost care and has been checked very thoroughly. Our own lists were used as a basis and every name has been submitted to the department in which it belongs for approval or correction. In some cases special correspondence has been necessary to secure correct spellings or titles. It is believed that the lists printed are the most accurate and up to date of their kind in existence.

Modifications in the highway laws of those states having highway departments, the establishment of departments in states where there were none previously, and changes in administrations have resulted in many changes in and additions to the names appearing in the directory printed a year ago. For that reason, it is felt that this year's directory is of especial value.

TAXING COMMERCIAL VEHICLE TRAFFIC

One of the most vexing problems in present-day road administration is that of imposing upon commercial vehicles a fair share of the burden of buildng and keeping in repair the roads upon which they have to travel.

These vehicles, like railroads, are operated for private gain, and like the railroads they transport passengers and merchandise. The business differs from a railroad enterprise, however, in that the transportation is over publicly owned highways instead of privately owned tracks.

Obviously those who derive profits from commercial vehicle operation should contribute to the cost of construction, maintenance, improvement and repair of the roads. The amount so contributed should be some definite proportion of the total cost, dependent upon the relation between the wear caused by the operator's vehicles and the wear caused by all vehicles.

This problem has troubled English officials longer than it has American administrators and is more acute in England than it is here. For these reasons it has probably been studied more thoroughly there than here, and while the problem in this country is different in many respects, we can learn much from the experiences of the English.

On other pages is printed an extract from a report on this problem recently submitted to an English county council by the county engineer. It contains much that should prove of interest and practical value to American road builders.

Bond Issues for Texas Road Districts

Activity in the matter of road improvement bonds is evidenced in a number of Texas counties. On Aug. 14 an issue of $75,000, was carried by Road District No. 2, in Calhoun County.

Road bond elections have been ordered in other counties as follows: Sept. 15, Anderson County, Road District No. 2, $20,000; Sept. 20, Navarro County, Rice Road District, $80,000; Sept. 22, Houston County, Road District No. 4, $40,000; Sept. 22, Montague County, Nocona Road District, $250,000.

A proposal for an issue of $300,000 for use in Bowie Road District in Montague County has been made, while an issue of $250,000 is proposed for the Timpson Road District in Shelby County. The elections have not yet been ordered.

The City of El Paso will shortly vote on a bond issue of $150,000 for street paving purposes.

"In War Times, Build!"

It is almost a shame to have to advocate a cause which of its own innate self—superficially, internally, externally, and in every other way—is so manifestly worthy.

We refer to the principle comprehended in the title of this article.

Yet, who hasn't heard the plaint: "We ought to go ahead with improvements, but the war ——?"

That's as far as they get, most of those who preface an apology for inactivity with these words, or similar. They are honest in that, often, they don't try to force or manufacture any additional excuses. Still, the doubt is father to inertia, and the tendency toward a chronic case of cold feet —chronic so long as the war lasts, at least—persistently wends its way.

It's too bad, this war time scare in its relation to building projects. Thank heaven it isn't general, but the seed of morbid suspicion has been so deeply rooted in many localities and in many minds that only a miracle, we suspect, will kill the "fear plant" before it attains a dangerous maturity.

We laud with all the enthusiasm that is in us the efforts of magazine and newspaper editors to allay the "building in war times" dread and dismay. It is an artificial, unfounded, unworthy weakness; and regarding it as such, we join hands with the patriots who just now are expending honest time and effort to clamp upon it a summary quietus.

Our particular interest lies in the highways of our state, yet the principle we apply to them will hold in the case of any legitimate building or improvement enterprise.

Creeks and rivers in Illinois during the next few years are going to continue to flow. Their channels will broaden a little each twelve months, and they will present the same barriers to traffic that they constitute today. It's going to take bridges to get across them a few years from now the same as it requires spans today. We'll not be able to fly, or wish ourselves our automobiles, rigs, and horses, across.

Illinois roads are not going to be improved unless we look after their surfaces. The mud is going to be just as deep five years from now on unimproved roads as it is today. Heavy tires on auto wheels will slip or mire down then the same as now. There isn't a chance in the world for transformation—unless money, plenty of it, and materials, vast quantities of them, are blended together and, with the aid of labor, molded into permanent traffic surfaces.

How utterly wrong even to think of a cessation of road, bridge and other building, just because the country is at war. War! The most pertinent and salient reason in all our history for a stimulated progress. Not an artificial progress. That isn't the idea. Don't misunderstand us. But a steady, energetic, reasonable and industrious activity in all lines of business. We've got to maintain such a status. If we don't, we might as well ask ourselves the sober question: "After the war, what national fate will we suffer?"

We cannot endorse hysteria in any form. That applies to frenzied editorials as well as paroxysms of fear with reference to industry and its status during the war. We are endeavoring, therefore, to weigh our words. War time, of all times, precludes the policy of "easing up" on building. We've got to preserve the potential value of our country. Without it, we are weakened—and more liable to fall a prey to an invading enemy. With a nation hustling and bristling with an "as usual" air, in all its avenues of business, we are a thousand times more apt to prove invincible, financially and in man power.—From "Illinois Highways."

Observance of Detour Law in Ohio Urged

The Ohio Good Roads Federation has called the attention of county officials to the provision of the White-Mulcahy highway law of 1917, requiring contractors to construct temporary highways or erect plain and unmistakable detour signs whenever a road is closed for improvement or repair, in a pamphlet entitled "Forms and Suggestions for Legislative Procedure for Road Improvement by County Commissioners." The booklet explains the provisions of the law, and points out to commissioners that before awarding a contract for highway, bridge or culvert construction, whether or not it is necessary to close the highway to traffic must be determined by the county surveyor. If a temporary road is found advisable, an estimate of the expense of constructing it must be made and included in the specifications for the contract. If a detour is necessary, the cost of signs and barriers must be included in the specifications.

Signboards on Missouri Roads

The erection of road signs on Missouri roads is among the subjects of a recent bulletin issued by the Missouri State Highway Department.

The department is calling attention to one of the sections of the new road laws, providing for the placing of signboards at road intersections. According to the terms of the law, it is the duty of road overseers to erect and maintain at all road intersections where confusion as to the proper route might exist, signs directing the way and showing the distance to the next important place. An overseer is allowed an amount not exceeding $1, from the road fund of the district, for each signboard. According to the State Highway Commission there are few counties in Missouri in which the roads are properly marked and compliance with this particular provision of the statutes is urged.

The commission also suggests to road overseers the placing of signs giving information of interest and value to travelers. It is suggested that these signs carry warnings against sharp curves and dangerous crossings, and give correct distances between various points.

An Ordinance to Prevent the Operation of Stone Crushers in Providence, R. I., is said to be under consideration by the Town Council. The State Board of Public Roads, which has recently installed a crusher on Cumberland Hill for the purpose of preparing trap rock for state road improvement in Providence, is expected to oppose the passage of the proposed ordinance.

A Contract for Paving the Little Falls Road, Cedar Grove, N. J., with amiesite, was recently let to Francisco Bros., of Great Notch, for $38,614. A steel bridge over the Peckman River, on this road, will be erected by Averill Matthews, of Newark, at a cost of $10,449. Other bidders for the road contract were Osborne & Marsellis, of Montclair, $38,947, and the Union Building & Construction Co., of Newark, $56,644.

MEETINGS

Calendar of Coming Meetings

Sept. 11-13.—American Association of Park Superintendents.—Annual convention, St. Louis, Mo. Secretary, Roland W. Cotterill, 533 City Hall, Seattle, Wash

Sept. 18-20.—League of Iowa Municipalities.—Annual convention, Iowa City, Ia. Secretary, Frank G. Pierce, Marshalltown, Ia.

Sept 18-20.—League of Virginia Municipalities.—Annual convention, Lynchburg, Va. Secretary, L. C. Brinson, Portsmouth, Va.

Sept. 24-29.—League of California Municipalities.—Annual convention, Santa Rosa, Cal. Secretary, Wm. J. Locke, Pacific Building, San Francisco, Cal.

Sept. 27-29.—Washington State Good Roads Association.—Annual convention, Bellingham, Wash. President, Robert L. Sprager, Artic Club, Seattle, Wash.

Oct. 9-12.—League of Kansas Municipalities.—Annual convention, Wichita, Kan. Secretary C. H. Talbot, University of Kansas, Lawrence, Kan.

Oct. 17-18.—League of Minnesota Municipalities.—Fifth annual convention, St. Cloud, Minn. Secretary-Treasurer, Richard R. Price, University of Minnesota, Minneapolis.

Oct. 29-30.—Oklahoma Society of Engineers.—Annual convention, Oklahoma City, Okla. Secretary-Treasurer, H. V. Hinckley, Oklahoma City, Okla.

Nov. 19-24.—City Managers' Association.—Annual meeting, Detroit, Mich. Secretary, W. L. Miller, City Manager, St. Augustine, Fla.

Nov. 21-24.—National Municipal League.—Twenty-third annual meeting, Hotel Statler, Detroit, Mich. Secretary, Clinton R. Woodruff, 703 North American Building, Philadelphia, Pa.

Jan. 15-17, 1918.—Virginia Good Roads Association.—Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

Washington Associations in Joint Session

The annual conventions of the Washington State Association of County Commissioners and the State Association of County Engineers close at Spokane today, portions of the meetings being conducted jointly. The following appear on the program of the joint sessions:

Report of Joint Committee on Cost Data for Construction and Maintenance of Roads, D. H. White, County Engineer of Pierce County; "Greater Efficiency in Road Expenditures," Prof. O. L. Waller, Department of Civil Engineering, Washington State College; "Considerations Governing the Choice of the Various Types of Road Construction," L. V. Edwards, Professor of Highway Engineering, Washington State College; "Planning of County Highway Work," Dr. L. I. Hewes, District Engineer, U. S. Office of Public Roads and Rural Engineering.

Papers appearing on the program of other sessions are "Highway Development of the Future," R. H. Thompson, Seattle; "Concrete Roads of Washington" (Illustrated), C. N. Reitze, Consulting Engineer, Portland Cement Association; "Procedure Under the Permanent Highway Laws," H. G. Porak, Assistant State Highway Commissioner, Olympia; "The Use of Bitumens in Road Cnstruction and Maintenance," Allen R. Scott, County Engineer, Spokane County; "Early Road Building in Washington," N. B. Brooks, attorney, Goldendale; "The Preparation of Preliminary Estimates," H. J. Doolittle, Division Engineer, Washington State Highway Department.

Good Roads Day in Kansas

Wednesday, Sept. 12, will be observed at the Kansas Free Fair, at Topeka, as good roads day. The meeting will begin at 10:00 a. m., and according to an announcement made by the Kansas Good Roads Association, speeches will be made by W. S. Gearhart, State Highway Engineer, E. R. Moses, Member of the State Highway Commission, L. F. Davidson, Director of the Midland Trail, and W. W. Watson, President of the Meridian Road Association.

American Association of Park Superintendents

Advices from Roland W. Cotterill, Secretary of the American Association of Park Superintendents, concerning the program of the annual convention to be held in St. Louis, Mo., on Tuesday, Wednesday and Thursday of next week, as noted in the issue of Aug. 25, is to the effect that on account of a number of important committee reports and important constitutional amendments to be submitted, no formal papers were invited, the time being left open for discussions of an informal nature, the social program being of such a nature as will provide a number of educational features.

Good Roads Field Day Celebrated in Michigan

The unveiling of the Earle Monument at Cass City, Mich., on Aug. 24, was witnessed by several thousand people, representing various organizations in the state interested in the improvement of highways.

As previously noted, the monument was erected in recognition of the work of Horatio S. Earle, the first State Highway Commissioner of Michigan during whose term the building of state reward roads began. The first address was delivered by Gov. A. E. Sleeper. Frank F. Rogers, State Highway Commissioner, road officials, and officers of road associations, spoke on the general theme of highway improvement.

PERSONAL NOTES

Calvin W. Hendrick has resigned as Chief Engineer of the City of Baltimore.

J. S. Bright, who was recently engaged as Resident Engineer on the highway system of Tulare County, California, has accepted a position as civil engineer for the United States Government, at Portland, Ore.

Chester H. Lehman, for the past six years Secretary and Director of the Blaw-Knox Company, has entered the service of the United States Government as first lieutenant in the Ordnance Department. Mr. Lehman is a graduate of Harvard University, class of 1909.

Lewis S. Louer has purchased half of the common stock of 'Engineering and Contracting," becoming joint owner with Halbert P. Gillette of that publication. Mr. Louer will assume the business management of the paper, Mr. Gillette remaining Chief Editor.

Robert Rogers, Minister of Public Works of the Dominion of Canada, has resigned.

N. S. Mullican, City Manager of Thomasville, N. C., has been appointed Chief Highway Engineer of Davidson County. He will continue to act as Consulting Engineer for the City of Thomasville.

Austin B. Fletcher, State Highway Engineer of California, has been appointed President of the State Reclamation Board, succeeding V. S. McClatchy. This appointment, it is understood, will in no way affect Mr. Fletcher's work as chief executive of the State Highway Department.

C. N. Wiley, who has been connected with the cement industry for the past fifteen years, has been appointed District Engineer in charge of the southeastern branch of the Portland Cement Association, with headquarters in the Hurt Building, Atlanta, Ga.

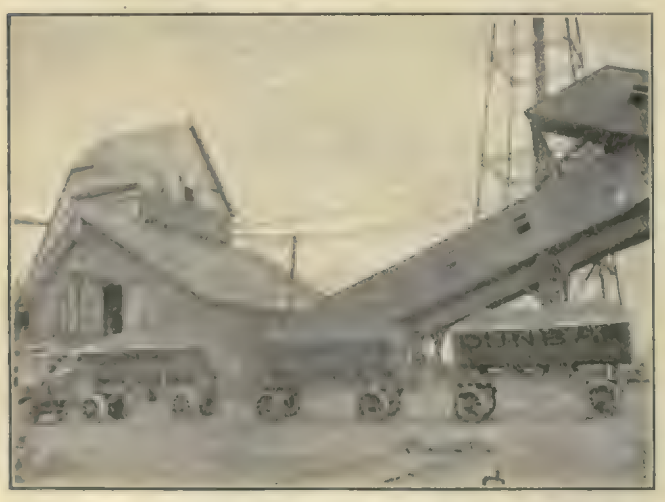
R. T. Brown, former Highway Engineer of Davidson County, North Carolina, has been appointed as Assistant Engineer of the South Carolina State Highway Commission. Mr. Brown was County Engineer and Superintendent of Orange County, North Carolina, for a period of three years. He has also served as Locating Engineer with the North Carolina Geological and Economic Survey.

EQUIPMENT — TRADE — MATERIALS

Tractor Train Reduces Hauling Costs

When reductions in the cost of hauling can readily be seen to increase materially the profits to be made, those having much hauling to do are quick to utilize time and labor saving equipment. An outfit which serves this purpose is shown in the accompanying illustration.

The train consists of a Knox tractor and three Lee trailers. The front and rear trailers have a capacity of 10 cu. yd. each, while the middle one has a capacity of 8 cu. yd. With the load heaped up, as shown, the capacities are increased to 12½ and 10 cu. yd., respectively, or a total load of 35 cu. yd. The outfit is loaded by means of a clamshell bucket, and requires five or six men. It is stated that the train does the work of twenty teams that would require a large gang of laborers for loading, and that it does the work in about one-fifth of the time.



KNOX TRACTOR AND LEE TRAILERS CARRYING CRUSHED STONE AT DETROIT, MICH.

The outfit is owned and operated by the Dunbar Stone Co., of Detroit, Mich., and it is said that even in that city, where unusual motor vehicles are not novelties, the train excites great interest. Bright yellow paint and the word "Dunbar" in 2½-ft. black letters on the trailers help attract attention and enhance the advertising value of the train.

Blaw-Knox Company Enters the Mixer Field

A. W. Ransome, who for nearly twenty years has been closely identified with the development and manufacture of concrete machinery, has become associated with the Blaw-Knox Co., of Pittsburgh, Pa.

During the past two years, Mr. Ransome has been developing and putting into practice sundry improved patents on concrete machinery. All of these have been purchased by the Blaw-Knox Co., and will be marketed and further developed under his direction as manager and chief engineer of the mixer department.

The merger by which the Blaw-Knox Company was formed was noted in "Good Roads" for August 25.

Ransome Concrete Machinery Company Newly Incorporated

Announcement has recently been made that increasing business has necessitated incorporating anew, with larger capital, the Ransome Concrete Machinery Co.

The new corporation, the Ransome Concrete Machinery Co. of New Jersey, takes over the business and plants of the Ransome Concrete Machinery Co. of New York. It will enlarge the plants and further expand its lines. The company has been capitalized at $1,000,000—$500,000 in cumulative preferred stock and $500,000 in common stock.

The company has been in business for over 25 years and has built up a world-wide trade. E. L. Ransome, the former head of the concern, was succeeded about three years ago by Frank L. Brown, under whose direction the business has continued the expansion begun under Mr. Ransome. An anticipated increase in the demand for the company's product and a growing South and Central American trade are given as among the reasons for the larger capitalization.

Frank L. Brown, New York, N. Y., is president of the new company, and John J. Givens, Dunellen, N. J., is treasurer. The Board of Directors consists of Messrs. Brown and Givens and the following: H. K. Brooks, Vice President, American Express Co., New York, N. Y.; C. H. Haney, Sales Manager, International Harvester Corp., Chicago, Ill.; Robert R. Moody, New York, N. Y.; John G. Wood, General Manager of Works, International Harvester Corp., Chicago, Ill.; and G. F. Steele, New York, N. Y.

The Walter A. Zelnicker Supply Co., of St. Louis, Mo., has announced that it has secured the services of J. C. Bryan, formerly with Manning, Maxwell & Moore. Mr. Bryan, according to the announcement, will be associated with the equipment department of the Zelnicker Company.

The Asbestos Protected Metal Co. of Pittsburgh, Pa., has announced that C. A. Crowe, formerly manager of the company's Grand Rapids office, has been placed in charge of the Detroit office. The company has also announced the appointment of M. W. Taber as factory manager. Mr. Taber was formerly Detroit manager.

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Methods of Constructing Sheet Asphalt Pavements in Manhattan Borough, New York City

A total of some five million square yards of sheet asphalt on its streets indicates the importance of that type of pavement in the Borough of Manhattan, New York City. It is laid on more than half of the borough's total street mileage and exceeds in area any other one type of pavement by something like three and a half million square yards. In view of this very extensive use, it is natural that the engineers and chemists of the Bureau of Highways should have given much time to a study of sheet asphalt construction and should have developed methods that represent the best practice in modern street paving.

The total area of sheet asphalt pavement on the borough streets Jan. 1, 1917, was 4,769,999 sq. yd., exclusive of the yardage in the railroad area, which includes the area between the rails and 2 ft. outside of the tracks. Of this total 3,269,447 sq. yd. were out of guarantee and, therefore, under maintenance by the city, while 1,500,552 sq. yd. were still under maintenance by contractors. While much of the sheet asphalt in the borough is laid on concrete foundations, there is a considerable area on other bases. Included in this are 2,034,520 sq. yd. on old stone block pavements, and 73,959 sq. yd. on old macadam.

At present all sheet asphalt is laid with a close binder, but there is a large yardage of pavement with common binder. Of over 2,500,000 sq. yd. laid on concrete foundation, approximately 1,500,000 sq. yd. are laid with the close binder.

The standard sheet asphalt pavement as now laid in the borough consists of 1½-in. binder course and a 1½-in. wearing surface, the binder course being in all cases of the close binder type. The work is done by contract, five or six large contracting companies handling all of it.

The specifications for asphalt define that term as applying to solid natural asphalts, either pure or mixed with native non-bituminous matter; natural liquid asphalts, and asphalts obtained from the distillation of asphaltic petroleum. Mixtures of asphalts of different kinds may be used only with the written consent of the engineer, except as expressly permitted by the specifications. These provide that mixtures of asphalts will be permitted only when the several types, each of which must comply with the asphalt specifications, are in proportions approved by the engineer; when the mixtures are made at the contractor's plant under the direct supervision of the engineer; and when the asphaltic cement resulting from the mixture complies with all the require-

FIFTH AVENUE NORTH FROM 32D ST., NEW YORK CITY—SHEET ASPHALT PAVEMENT.

ments of the specifications for asphaltic cement. The specifications for asphaltic cement are as follows:

It shall be completely fluxed and thoroughly homogenous.

It shall have the penetration between 30 and 50, as directed by the engineer in writing. If an asphaltic cement contains natural mineral matter, a reduction on the required penetration of five points shall be made for each 10% of such natural mineral matter present.

The asphaltic cement shall not lose more than 3% of the bitumen present by volatilization at a temperature of 325°F., nor shall the penetration of the residue after such heating be less than one-half the original penetration.

Either the asphalt cement as prepared at the paving plant and as used, at 50 penetration, or the purified bitumen obtained therefrom at 50 penetration, when made into a briquette having a minimum cross-section of one square centimeter, shall have the ductility at 77°F. of not less than 50 cm. at the time of rupture, the rate of elongation being 5 cm. per minute. If the asphaltic cement as used complied with the requirements for ductility no test of the purified bitumen for ductility will be required. If the consistency of the asphaltic cement as used, or of the purified bitumen therefrom, above mentioned, is greater or less than 50 penetration, the above requirement for ductility shall be modified as follows:

For each increase of 5 units in penetration of the asphaltic cement as used (or of the bitumen therefrom), above 50, 2 cm. shall be added to the requirement for ductility at 50 penetration as above established; and for each decrease of 5 units in penetration of the asphaltic cement as used (or of the bitumen therefrom), below 50, 2 cm. shall be subtracted from the requirement for ducility at 50 penetration as above established.

The asphaltic cement when at a penetration of 50 at 77°F. shall not be so susceptible to changes in temperature that the difference between its penetration at 100°F. and at 32°F. shall be more than 200; in each case the penetration test being made with a No. 2 needle, for 5 seconds under a load of 100 grams.

If the asphaltic cement, as used, has a penetration greater or less than 50 at 77°F., its penetration at 100°F. shall not exceed four times its penetration at 77°F., the conditions of time and load being as above established.

The asphaltic cement shall have a penetration within the limits above specified, but the penetration shall be varied within these limits to adapt it to the character of the particular asphalt used, to the general character of the mineral aggregate of the paving mixture and to the character of the traffic on the street. The penetration of the asphaltic cement shall be as directed by the engineer in writing for each street and the asphaltic cement as used shall not vary more than 5 points plus or minus from the penetration directed.

The words "penetration" and "consistency" when used in the specifications, are defined as signifying the "distance expressed in hundredths of a centimeter, that a No. 2 needle will penetrate the same at 77° F. in 5 seconds, under a load of 100 grams," unless otherwise stated.

All refined asphalts used in sheet asphalt paving in the borough must comply with the following specifications:

The refined asphalt of each shipment of any one kind shall be uniform in composition, consistency and ductility.

It shall not vary more than 10 units in penetration from maximum to minimum.

Should the ductility of the asphalt of any part of any shipment fall below 100 cm., it will be required that the ductility of the asphalt of said shipment shall not vary more than 30 cm., in ductility from maximum to minimum.

Not less than 98½% of the total bitumen of all refined asphalts shall be soluble in carbon tetrachloride.

When made into an asphaltic cement by the use of such materials and methods as are described in these specifications, they must produce an asphaltic cement complying with all the requirements herein set forth for asphaltic cement.

Under the volatilization test at 325° F. the refined asphalt shall not lose more than 3% of the bitumen present, nor shall the penetration after such heating be less than one-half the original penetration. This requirement for determining the "per cent. of hardening" shall apply only to asphalts having a penetration of 10 or more.

Refined asphalts, according to the specifications, must be obtained by either of the following methods:

(a) Heating solid crude natural asphalt, without adding other materials, to a temperature not exceeding 400° F. until all the water has been driven off and the product complies with the specifications for refined asphalt;

(b) By distilling asphaltic petroleum or natural liquid bitumen, without adding other materials, at a temperature of not over 700° F., constantly agitating the materials by steam or other methods during the operation.

When refined asphalts are obtained by the first method, the process must be continued until the product has a penetration of not over 30. When prepared by the second method, the penetration must be between 60 and 30. It should be noted in this connection that the Borough of Manhattan now uses asphalts of a lower penetration than has been permitted previously in the borough or is used in the majority of cities.

The fluxing material is the residuum from the distillation of paraffine, semi-asphaltic, or asphaltic petroleum. Paraffine residuums are defined as those having a specific gravity between 0.92 and 0.94 at 77° F.; semi-asphaltic residuums as those having a specific gravity between 0.94 and 0.98 at 77° F., and asphaltic residuums as those having a specific gravity between 0.98 and 1.01 at 77° F. Residuums must contain not less than 99% of bitumen soluble in carbon bisulphide at air temperature, not less than 98⅛% of such bitumen being soluble in carbon tetrachloride. They must have a penetration of over 350 at 77° F. using a No. 2 needle and a 50-gram load for one second. They must not flash below 350° F. when tested in a New York State Closed Oil Tester. The loss by volatilization must not be greater than 3% at a constant temperature of 325° F. for 5 hours, and the residue, after heating, must be homogenous and must flow at 77° F. The specific gravity must be not less than 0.98 and not more than 1.01.

The stone used for binder is a hard, clean stone not more than 5% of which is retained on a 1-in. circular screen and not more than 5% of which passes a 10-mesh sieve. The grading must be such as to produce the percentage composition specified for the binder mixture.

The binder sand must be clean and sharp, while the sand used in the wearing surface must be hard-grained, moderately sharp and clean. Sand for wearing surface mixtures must also be so graded as to produce the mesh composition specified for the finished surface mixture and must not contain more than 5% of material passing a 200-mesh sieve. Considerable difficulty is experienced by the city in obtaining sand which is sufficiently fine and at the same time conforms with the specifications in other respects.

In preparing the binder course, the stone and sand are heated to a temperature of not more than 350° F. before delivering to the weighing box. They are then mixed by machinery with asphaltic cement at a temperature of from 300 to 350° F. Each of the three ingredients is weighed separately for each batch mixed, the proportions being by weight. The specifications for the binder mixture, as laid, call for the following composition:

Material.	Percentage of Total.
Mineral Aggregate:	
Retained by 1-in. circular mesh screen	Not over 4
Passing 1-in. and retained on ½-in circular mesh screen	25 to 55
Passing ½-in. circular mesh screen and retained on 10-mesh screen	20 to 45
Passing 10-mesh screen	20 to 40
Bitumen	5 to 8

The wearing surface is composed of asphaltic cement, sand and Portland cement filler. The composition by weight when laid is shown in the following table:

Material.	Percentage of Total.
Mineral Aggregate:	
Retained on 10-mesh sieve	None
Passing 10-mesh and retained on 40-mesh sieve	10 to 30
Passing 40-mesh and retained on 80-mesh sieve	20 to 55
Passing 80-mesh and retained on 200-mesh sieve	15 to 30
Passing 200-mesh sieve	13 to 20
Bitumen	10 to 12.5
Filler	

The term "mineral aggregate" when used in connection with the wearing surface signifies the total material in the mixture, which is insoluble in carbon bisulphide, this including besides the sand and filler, such matter as may be contained in the asphaltic cement. The penetration of the asphaltic cement for surface mixtures is specified at from 30 to 50 but may be varied by the engineer, in special cases, the upper limit, however, not exceeding 60.

The sand and asphaltic cement are heated separately to approximately 325° F. The temperature of the sand as delivered at the mixing box shall, in no case, exceed 400° F., and that the asphaltic cement, in no case exceed 350° F. The filler, heated to not over 325° F., is thoroughly mixed with the heated sand and the resulting mixture then mixed with the asphaltic cement. The specifications for temperature of each batch of surface mixture stipulate maximum temperatures immediately after mixing and minimum temperatures when delivered on the street as shown in the following table:

Source of Asphalt.	Max. Temp. at Plant.	Min. Temp. on the Street.
Trinidad	350°F.	295°F.
Bermudez	325°F.	270°F.
Mexican asphaltic petroleum	325°F.	270°F.
California asphaltic petroleum	315°F.	260°F.

The binder mixture is hauled to the work in covered vehicles and must reach the street under construction at a temperature between 225° and 325° F. It is spread on the prepared foundation in such amount as to give an average thickness of 1½ in. after rolling. It is raked to the required thickness and thoroughly compacted by a roller weighing not less than 200 lb. per inch width of tread of main roll. The laying of the wearing surface is done as soon as possible after the laying of the binder, in every case on the same day. The wearing surface mixture is brought to the street, covered while in transit, and dumped outside of the area on which it is to be laid. It is then deposited with hot shovels and spread uniformly with hot iron rakes to a thickness that will compress to 1½ in. Before the surface mixture is laid those portions of curbs, manholes and the like, that are to come in contact with the wearing surface, are thoroughly painted with heated asphaltic cement. The wearing surface mixture, after being laid, is rolled in the same manner as the binder.

DUMPING AND SPREADING SHEET ASPHALT MIXTURE ON FIFTH AVE., NEAR 30TH ST.

Rolling of the wearing surface must be continued until the mixture has a density of not less than 2.10 for work that is done between April 1 and Dec. 1, and not less than 2.05 for work done between Dec. 1 and April 1. The density, as used in this portion of the specifications, is defined as the quantity of matter in a unit volume as compared with water at a temperature of 4° C. The density obtained is determined by testing samples cut from the finished pavements.

Another feature of the Manhattan Borough work is the careful inspection of mixtures at the contractors' plants. An inspector rated as a junior chemist is detailed to each plant where mixtures are being prepared and is charged with the testing of all materials and mixtures.

SHEET ASPHALT PAVEMENT ON GRAMERCY PARK, WEST —VIEW LOOKING NORTH.

Report on Street Conditions in Omaha, Neb.

The Commercial Club and affiliated bodies submitted a report last month to the City Commission on the result of a month's investigation of street paving conditions in Omaha, Neb., in which certain causes that contribute to poor streets were named. The report also contained suggestions as to methods that it was thought would bring about improvement, one of these being to the effect that the paving and the repair work should be done by the same department, which is not the case under the present system.

Imperfect preparation of the ground for paved streets before the earth has been properly rolled and fully settled, is one of the reasons stated for defective paving. Insufficient heavy rolling of dirt foundation upon which the base is laid, an insufficient amount of cement in the concrete base, lack of expansion joints to provide for contraction and expansion, improper care in the opening and filling of public

SHEET ASPHALT PAVEMENT ON W. 40TH ST.—METROPOLITAN OPERA HOUSE AT LEFT.

service street connections, the effect of gas leakage upon asphalt pavements in certain localities, and the use of heavy trucks are other causes cited.

The recommendation was made that an ordinance be passed making mandatory the laying of service pipes before the pavement is put down; otherwise to provide a sufficient additional charge to insure against future damages to the street. It was also suggested that all railroad crossings should be paved at the expense of the railroad company, and that street railway be compelled to relay defective pavement between its rails.

Tractive Resistance Tests by the California State Automobile Association

Tests to determine the tractive resistances of various road surfaces were recently made for the Good Roads Bureau of the California State Automobile Association by the staff of the division of agricultural engineering of the University of California. A discussion of the tests and their results and the report made by J. B. Davidson, Professor of Agricultural Engineering at the University of California, are printed in a booklet entitled, "How Much Does Your Team Pull?" This was recently issued by the California State Automobile Association.

The tests were made on June 13 and July 9 and 10 by Professor Davidson and his assistant, L. J. Fletcher, with the cooperation of Austin B. Fletcher, State Highway Engineer of California, and C. H. Sweetzer, District Engineer and W. H. Lynch, Senior Highway Engineer, of the Office of Public Roads and Rural Engineering, U. S. Department of Agriculture.

The tests were made by drawing a loaded standard farm wagon over the various road surfaces tested and measuring the resistance by means of a dynamometer. The wagon used had steel axles of equal length, with 38-in. and 46-in. wheels, with 4-in. tires. The weight of the wagon and its load of rice in sacks was 6,000 lb. On all the tests except those on oil macadam, the wagon was drawn by two draft horses weighing about 1,600 lb. each. On the oil macadam tests the wagon was drawn by a 2-ton truck owned by the California State Highway Commission. An "Iowa" integrating and recording dynamometer was used to measure the resistance. This instrument is one of the type designed by Prof. Davidson while on the staff of the Iowa State College. Besides permitting a direct reading of the resistance it makes a graphic record on a strip of paper passing under a recording pencil.

All factors influencing the results of the tests, except the character of the road surface itself, were kept as uniform as possible throughout the series. The experiments were made on bright, sunny days on which the highest temperature was about 105 degrees. The rate of travel averaged about 2.4 mi. per hour for the team, and where the work was done on grades, tests were made both up and down grade, and the results averaged. The tests were started after the loads were in motion, and were moving at a uniform rate. With the motor truck one test was made at about 2.5 mi. per hour and the other at about 5 mi. per hour.

The results of the tests are given in a table, from which the table herewith has been prepared.

RESULTS OF TRACTION TESTS MADE BY PROF DAVIDSON, OF THE UNIVERSITY OF CALIFORNIA, UNDER THE AUSPICES OF THE CALIFORNIA STATE AUTOMOBILE ASSOCIATION.

Number of tests	Kind of road	Condition of road	Tractive total	Resistance per ton
1	Earth	Firm, 1½ in. fine. loose dust	276.0	92.0
3	Earth	¾ to 2 in. of dust	298.0	99.3
2	Earth	Mud, stiff, firm underneath	654.0	218.0
1	Gravel	Compact, good	225.0	75.0
1	Gravel	Packed, good	247.0	82.3
2	Gravel	Loose	789.0	263.0
2	Macadam, water bound	Good, excellent	193.0	64.3
2	Oil Macadam	Good, new	234.5	78.2
2	Oil Macadam	Good, new	244.0	81.3
3	Topeka on plank	Good, soft	265.0	88.3
2	Topeka on plank	Good, but soft	278.0	92.6
2	Topeka on concrete	Good, excellent	205.5	68.5
3	Concrete (unsurfaced)	Good, excellent	83.0	27.6
2	Concrete (unsurfaced)	Good, excellent	90.0	30.0
3	Concrete, ⅜-in. surface, asphaltic oil and screenings	Good, xcellent	147.6	49.2
2	Concrete, ⅜-in. surface, asphaltic oil and screenings	Good, excellent	155.0	51.6

Road Builders Wanted for Service in France

A call for road builders for the National Army has been issued by Maj. J. E. Bloom, U. S. A. Recruiting Officer. The call is not only for skilled engineers, but also for helpers and workers now associated with them in such occupations as road building, railway construction and operation, building, quarrying, and other work handled by engineer troops.

According to the circular, enlistments are invited for units now being organized as follows: 20th Engineers, forestry, at American University, Washington, D. C.; 21st Engineers, light railway, at Rockford, Ill.; 23d Engineers, highway, at Annapolis Junction, Md.; 25th Engineers, construction, at Ayer, Mass. (less one company, camouflage); 25th Engineers, construction, one company for camouflage, at American University, Washington, D. C.; 26th Engineers, supply and water supply, at Wrightstown, N. J.

All applicants are enlisted as privates, but according to the circular, may soon advance to corporals and sergeants upon qualification. Married applicants must have the approval of regimental commanders. All applicants must pass the same physical examination as is given other recruits. Branch recruiting stations are situated as follows: 269 Main St., Paterson, N. J.; 215 Main Ave., Passaic, N. J.; 55 Broad St., Elizabeth, N. J.; 103 E. State St., Trenton, N. J.; Post Office, New Brunswick, N. J.; 1530 Atlantic Ave., Atlantic City, N. J.; 130 Smith St., Perth Amboy, N. J.; 540 Federal St., Camden, N. J. Upon acceptance at the branch recruiting station, applicants are sent to the main office at 266 Market St., Newark, N. J., and then to Fort Slocum, N. Y., for medical examination and enlistment.

It is stated that applicants will be accepted only for the organization for which their previous training is deemed by the recruiting officer to have especially qualified them. Applicants are obliged to describe their occupation for about three years past, to state whether married or single, to describe any previous military service, to state the general condition of their health and to give the addresses of three citizens who know them. They are also allowed to express a preference for one of the regiments listed.

It is understood that the organizations listed are intended especially for service abroad. The enlistment is for the period of emergency only, and no man drawn for the draft is allowed to volunteer.

New Road Laws of Michigan

Several important changes were made in the highway laws of Michigan by the 1917 Legislature. Among these were changes in the provisions of the law providing for state rewards, a new statute regulating the use of steam engines on highways, new regulations for the operation of vehicles upon the highways, and a law accepting federal aid.

As noted in a previous issue ["Important Highway Measures under Consideration in Michigan," by D. A. Thomas, "Good Roads," March 3, 1917, page 152], the law relative to state rewards materially increases the amounts paid by the state to counties and townships for roads built in accordance with the standards of the State Highway Department. The 1917 law provides for rewards as shown in Table I, the "initial reward" being in each case the amount per mile paid for a road of the width specified in the column headed minimum width. The amount given in the column headed "additional reward" is the amount paid per mile for each foot of metaled width in excess of the minimum, up to and including the width given in the column headed "maximum width." The letters in the column headed "type of road" signify roads as follows:

TABLE I. AMOUNT OF STATE REWARDS PER MI. FOR VARIOUS TYPES OF ROADS

Type of Road	Initial Reward	Maximum width (ft.)	Additional Reward	Max. width (ft.)
(a)	$ 250	9	$ 25	16
(b)	500	9	50	16
(c)	750	9	75	16
(d)	750	9	75	16
(e)	1000	9	100	18
(f)	2000	9	200	20
(g)	2000	9	200	20

(a) A road consisting of "a mixture of sand and clay or other material."

(b) A road consisting of "not less than 8 in. of compacted gravel, or not less than 12 in. of compacted burnt shale, which must be applied in not less than two layers, each layer to be rolled separately."

(c) A two-course pavement consisting of a bottom course of crushed stone, slag or other material, at least 4 in. deep after rolling, and a top course, 3 in. thick after rolling, of gravel or blast furnace slag.

(d) A two-course roadway consisting of a bottom course not less than 4 in. thick after rolling of gravel, slag or other material approved by the State Highway Commissioner, and a top course, not less than 3 in. thick after rolling, of crushed stone.

(e) A two-course roadway, not less than 6 in. thick, consisting of a bottom course of crushed stone or slag and a top course of crushed stone, each course properly bonded with "stone screenings, asphalt, bitumen or other cement approved by the State Highway Commissioner."

(f) A pavement of "bituminous concrete or cement concrete, or such combination of these materials as may be specified, not less than 6 in. in depth, or bituminous concrete of not less than 3 in. compacted depth laid on a macadam base of not less than 5 in. compacted depth."

(g) A brick pavement laid on sand, gravel, broken stone, slag or concrete.

Of the seven types of road for which rewards are paid, the first five must be built with grades not exceeding 6% "except where found impracticable and a steeper grade is recommended after examination by the State Highway Commissioner." Bituminous and cement concrete pavements and brick pavements must be built with grades not exceeding 6%. The width between ditches must be not less than 20 ft. on roads in the first five classes, and not less than 24 ft. for roads in classes "f" and "g."

The state reward law also provides that any road may be built "with a central track of one class as above specified, and shoulders of a different class, and when so built, if approved by the State Highway Commissioner, shall merit a reward from the state for the central track as above specified, plus a reward for each extra foot in width for the shoulders according to the class built." In order to receive this extra reward, however, the plans for the work must be approved by the State Highway Commissioner before construction commences, and the total width rewarded will not exceed 20 ft.

Another section provides that any gravel road (class b) "shall be entitled to 15% reward added to the above specified reward for each 5% increase in percentage of gravel over 60% up to and including 85% retained on a ⅛-in. square mesh screen," and that any gravel surfaced road (class c) "shall be entitled to 5% reward added to the above specified reward for each 5% increase in the percentage of gravel surface over 60% up to and including 85% retained on a ⅛-in. mesh screen." These provisions, however, do not apply to double reward roads.

It should be noted that, according to the existing law, double rewards are paid for roads included in the state trunk line system.

The law relating to the use of steam engines on highways makes it unlawful to allow any vehicle or engine propelled by steam to stand on any bridge or culvert in a highway for taking any water or for other purposes, and makes it unlawful to operate such vehicles on any public highway unless "a person of mature age" is sent at least 10 and not more than 40 rods in advance of the vehicle to notify and warn other persons using the highways with horses or other domestic animals. The distance in incorporated cities and villages is reduced to not less than 4 rods and not more than 10 rods. These provisions do not apply to automobiles. Another section of this law makes it a misdemeanor to blow the whistle of a steam vehicle traveling on the public highways, unless it is necessary to blow the whistle to avoid accident.

Another section makes it unlawful to move "any traction engine or similar heavy machinery over the public highways, by its own power or otherwise, during the months of March, April and May, or at any other time, if by reason of the thawing of frost, or rains, or any other cause, the roads are in soft condition, rendering them unfit for passage over them of such heavy machinery without damage to the highways, or if the engines are equipped with lugs which seriously damage the highways, except by written permission from the commissioners having jurisdiction over said highway or highways." Failure to obey the provisions of this act is made a misdemeanor and the penalty is fixed at a fine of not less than $25 "nor in any event less than double the amount of damages which may have been caused to such highway or highways, as shall be estimated by the highway officials having jurisdiction over the highways which may be thus damaged."

The law regulating the operation of vehicles, including motor trucks and trailers, provides that it shall be unlawful to operate on the public highways of the state any vehicle whose gross weight exceeds 15 tons and that it shall be unlawful to operate any vehicle, except a motor-driven vehicle, having a gross weight on any wheel in excess of that given in Table II.

The law also provides that brakes must be of the friction type and not of a type that "will cause a deadlock of the wheels when applied."

Section 5 of the law limits the gauge of motor trucks and trailers to 75 in., center to center of tires, the width over all to 96 in., and the height to 12 ft. 6 in.

Section 6 provides that no motor truck or trailer shall be equipped with driving wheels with metal tires that may come in contact or partial contact with the surface of the road, except that chains or other non-skidding devices may be used. This provision is modified by a proviso that motor trucks or trailers may be used on any highway not a part of the state reward system, and a further proviso that if an improved highway is damaged by the use of chains or other non-skidding devices, the owner or operator of the vehicle shall be liable for the penalties provided by law.

TABLE II. MAXIMUM LOAD, GROSS, IN POUNDS, PER WHEEL AND ON 4 WHEELS, FOR VARIOUS TIRE WIDTHS

Width of tire (in.)	Maximum wheel load (lb.)	Maximum load, 4 wheels (lb.)
1	400	1600
1½	600	2400
2	800	3200
2½	1100	4400
3	1400	5600
3½	1800	7200
4	2200	8800
4½	2700	10800
5	3200	12800

Section 7 provides that all motor trucks or trailers shall have placed conspicuously upon them information relative to their height of wheel, width of tire, gauge, width over all, weight, and carrying capacity.

Sections 8 and 9 specify the allowed weights on rear and front axles. It is provided that 75% of the gross weight of a motor truck or trailer "and its respective carrying capacity" must be within the limits indicated in a schedule under Section 14 of the act (Table 3), providing that in the case of trailers having two wheels at least 75% of the gross weight of the trailer and its load must rest upon the axle of the trailer. The remainder of the load, carried by the front axle, must be within the limits of the schedule referred to. It is provided that the size of tire and height of wheel shall be taken as that printed upon the tire by the manufacturer. It is also provided that when a truck is hauling a trailer, the speed shall be governed by the vehicle having the lowest mile per hour rating.

TABLE III. MAXIMU MWHEEL LOADS AND SPEEDS FOR A WHEEL 32 IN.* IN DIAMETER, FOR VARIOUS SIZES OF TIRES

	Single Tires		Double Tires	
Size of tire (in.)	Maximum whl. loads (in.)	Speed mi. per hr.	Maximum whl. loads (in.)	Speed mi. per hr.
2	700	20	1400	18
2½	900	20	1800	18
3	1200	20	2400	18
3½	1600	20	3200	16
4	1900	18	3800	14
5	2200	16	4400	13
6	2700	14	5400	12
7	3200	12	6400	10

*For wheels of other diameters, multiply the maximum wheel loads in above table by the following: 34 in. wheel 1.1; 36 in. wheel, 1.2: 38 in. wheel, 1.3; 40 in wheel, 1.4; 42 in. wheel, 1.5; 44 in. wheel, 1.6

It is provided that when, because "of the thawing of frost, or rains, the roads are in soft condition," the maximum loads shall be limited to one-half the amounts specified in the law.

Motor trucks or trailers used as buses for carrying passengers, farm implements, and machinery used in road construction, are excepted from the provisions of the act. The act is also not applicable to public highways in cities and villages except where such highways are state rewarded roads.

The operation of vehicles contrary to the act is made a misdemeanor and the penalty is fixed at a fine of not less than $5 or more than $50, or imprisonment for not more than 30 days, or both.

In Section 1 of the law relating to federal aid, the state formally assents to the provisions of the federal aid law, pledges the faith of the state to provide funds for its portion of the cost, authorizes the State Highway Department to plan and supervise the work and make contracts for it, and authorizes the state treasurer to receive money due to the state from the government.

Section 2 authorizes townships, good roads districts and counties to raise funds by taxation or bond issues for the building of federal aid roads and to deposit their portions of the cost of such work with the state treasurer "to be credited to the specific federal aid road project for which the money has been appropriated." Taxes may be imposed and bonds issued for this purpose in the manner prescribed by existing laws, but the county road commissioners are not obliged to furnish plans or specifications and estimates for the work, this being the duty of the State Highway Commissioner.

Section 3 specifies the portion of the total cost of federal aid work to be paid by counties, good roads districts and townships. These are based on the valuation per trunk line mile and are the same for counties, road districts and towns. They are as follows: Valuation, $100,000 or less, 25%; valuation, $100,000 to $200,000, 30%; valuation, $200,000 to $300,000, 35%; valuation, $300,000 to $400,000, 40%; valuation $400,000 to $500,000, 45%; valuation, $500,000 and upward, 50%. In each case the state pays the balance of the cost from the funds appropriated for the purpose and from the funds alloted by the federal government, the cost of surveys and plans being paid for by the state. The valuation of a county per trunk line mile is determined by dividing the latest state equalized valuation of the county by the county's alloted trunk line mileage, computed on the basis of the number of surveyed townships in the county, as provided by law. The valuation of a township, or good roads district per trunk line mile is determined by dividing its assessed valuation, as shown by the assessment roll of the preceding year, by the actual number of trunk line miles in the district or township, as determined by the State Highway Commissioner.

Section 4 declares legal and valid all proceedings taken previous to the passage of the law in any township, good roads district or county, to raise money for federal aid work in accordance with the provisions of the act.

Section 5 provides that townships, good roads districts or counties in which federal aid roads are built must levy an annual tax equal to 3% of the amount which the township, district or county may have appropriated toward the cost of building federal aid roads, up to but not exceeding $100 per mi. per year. The money collected in this way must be put into the state treasury not later than the last day of March of each year and credited to the maintenance fund for each specific federal aid road project for which the money was raised, to be paid out by the State Highway Commissioner, who is authorized to maintain all federal aided roads in accordance with the federal requirements. It is also provided that the remaining portion of the cost of maintaining federal aid roads shall be paid out of state highway funds, not otherwise appropriated.

Section 6 provides that a township, good roads district or county that has raised money for federal aid road work may contract with the State Highway Commissioner at a price below that of the lowest responsible bidder and build or maintain the road under the supervision of the State Highway Commissioner, providing no satisfactory bid is received for building the road and all other bids are rejected.

Section 7 appropriates $225,000 for the year ending June 30, 1918 and $225,000 for the year ending June 30, 1919, to constitute a fund for the payment of the state's portion of the cost of federal aid road work, including the cost of

(*Continued on page* 140)

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

SEPTEMBER 15, 1917

ROAD BUILDERS WANTED FOR SERVICE IN FRANCE

A call for volunteers to build roads and perform similar work in France is noted elsewhere in this issue.

Of the five engineer regiments being organized to work with the National Army, one, the 23d Engineers, is designated as a highway unit. The requirements for enlistment are physical fitness and—it is assumed from the general tenor of the call—such experience as would qualify a man for the particular work this organization will be called upon to do.

There is no question of the loyalty and patriotism of the country's road builders. Many have already enlisted, some have received commissions and still larger numbers have already been drafted or will be called later. It is also certain that road builders will be more valuable in an engineer organization devoting its time to road building than they would be in an infantry organization fighting in the trenches.

For those above draft age who are physically able to enter the army and who have no dependents, and for those who are likely to be called to the colors, the raising of this unit appears to offer an especially good opportunity. Those who enlist can be sure of rendering the maximum service of which they are capable and, at the same time, of performing work not so greatly different from what they have been accustomed to doing as that which would fall to their lot as enlisted men in other arms of the service. In addition, there is every reason to believe that the men in this and similar organizations will gain very valuable technical experience and it is sure that the military training and discipline will be an asset later.

Another factor to be considered is the possibility of employment in France or Belgium after the war. The magnitude of the work of reconstruction to be done in those countries insures work for large numbers of engineers. It is likely that there will be openings for Americans, and those already on the ground, who have had an opportunity to familiarize themselves with the methods, customs and language of the country, will have a great advantage over those who lack such knowledge.

Everything considered, the formation of these units affords American road builders an exceptional chance to serve their country and themselves.

AN OPPORTUNITY FOR WORTH-WHILE MISSIONARY WORK

One of the greatest obstacles to the betterment of the country's roads is the difficulty of getting information of the right sort before the general public. For that reason, every opportunity to reach the people, either directly or indirectly, should be seized and made the most of by those who have the cause of good roads at heart and who are in a position to speak with authority. Such an opportunity presents itself in the meeting of business men called by the Chamber of Commerce of the United States for Atlantic City, N. J., on Tuesday, Wednesday, Thursday and Friday of next week.

The desirability—even the necessity—of giving the people of the country reliable information as to the road situation is obvious. Every year enormous amounts are expended for road work and a very large proportion is spent unwisely. Growing traffic demands are calling for greater expenditures and for the elimination of waste in the use of road funds. Roads can not be built and maintained without funds, and if the required money is to be secured the advantages of good roads must be brought home to the people and the need for economy and efficiency in construction and maintenance must be impressed upon those who, directly or indirectly, choose the administrators of the road laws.

The great majority of the voters of the country are included in two classes—wage earners and business men. The latter class comprises a very large number of men who are leaders in their communities and are every day taking an increasingly prominent part in public affairs. If they understood the road situation as well as they understand some other branches of public work they could be depended upon to render very material aid to the cause of road improvement, for they would realize how much their own interests would be advanced by good roads.

They do not understand the situation, however, because like other laymen they are not reached through the channels in which reliable information is circulated. They naturally do not read engineering periodicals, nor do they often avail themselves of the highway department reports and government publications that can be had. Almost their only sources of information are the newspapers and their observations as road users. The latter are obviously as apt to lead to erroneous as correct conclusions. The former source is, to say the least, not informative, for the newspapers' attention to road matters is generally from a political viewpoint.

The special meeting of business men at Atlantic City will bring together men from all parts of the country. One of the questions to be discussed is: "How may the business of the country render greater service in winning the war?" Any one of the topics listed under this main head is: "How shall greater efficiency in land and water transportation be developed?"

Of course there are many ways of developing the country's transportation, but the one thing that would do the most is the development of the highways. This fact ought to be put before the business men at Atlantic City in a way that would carry conviction. The way to bring about that development ought also to be pointed out, with strong emphasis on some of the underlying principles with which road builders are familiar but which are unknown to laymen.

It is to be hoped that among the men who attend the meeting there will be someone conversant with road matters who will have the ability and the will to impress upon the meeting the importance of the development of the country's roads and to outline some of the principles that should be observed in road improvement.

New Road Laws of Michigan

(*Continued from page 138.*)

preliminary investigations, surveys, plans and specifications. Any money remaining in this fund at the close of the fiscal year is carried over and made available for the following year.

Section 8 provides that there shall be incorporated in the state taxes for 1917, the sum of $225,000 and for the year 1918, $225,000 to be credited to the general fund for reimbursing the same for the money appropriated by the act, provided that the amount appropriated for the fiscal year ending June 30, 1918, shall be deemed to be available at once and that as much as necessary of it may be paid out prior to July 1, 1917.

Report of Highway Work in Arkansas

A report of progress made in highway improvement in Arkansas made by the State Highway Commission, shows that up to Aug. 31, 283.61 mi. of roads had been surveyed; plans and other work completed for 279.95 mi.; petitions for surveys received for 259 mi., and that preliminary work was being done on 304.64 mi. of unsurveyed roads.

The roads that have been surveyed are in Baxter, Boone, Clark, Columbia, Conway, Desha, Hempstead, Independence, Izard, Jackson, Nevada, Pike, Perry, Pope, Poinsett, Pulaski, Stone, Van Buren, Washington and White Counties.

"Short Term" Labor Experiment in Rhode Island

The utilization of "short term" prison labor on the highways of Rhode Island was authorized by the passage of an act, which was printed in full in "Good Roads" of June 9. Under that law, power is conferred upon the Penal and Charitable Commission to place at the disposal of the State Board of Public Roads such number of convicts as may be requested by a majority of the members of the board.

Highway building by means of prison labor is, therefore, in the experimental stage in Rhode Island, but is reported to be working successfully. The selection of camp locations free from intrusion by the public and affording a maximum degree of comfort as living quarters for the workers, is a matter to which especial attention is paid. Although the labor is performed under the direct supervision of the highway authorities, the prisoners are guarded by the Penal and Charitable Commission. Those who work upon the roads have their evenings for leisure or games. The daily routine is as follows: Rise at 5:00, breakfast at 6:00, and begin work at 7:00 o'clock; dinner at 12, supper at 5:15; retire at 9:00.

Plain but wholesome food is provided for the prisoners as indicated by the following weekly menu:

Sunday—Breakfast: Baked beans, coffee, bread and butter. Dinner: Pot roast and gravy, potatoes, beets, bread and butter, cake and tea. Supper: Prune sauce, bread and butter, cake.

Monday—Breakfast: Beef stew, rice with milk and sugar, bread and butter, coffee. Dinner: Boiled dinner with vegetables, bread and tea. Supper: Vegetable hash, bread and butter, tea.

Tuesday—Breakfast: Eggs and bacon, bread and butter, coffee. Dinner: Mutton stew, vegetables, lettuce and bread. Supper: Beans, bread and butter, tea and cake.

Wednesday—Breakfast: Frankforts and potatoes, rice with milk and sugar, bread and butter, coffee. Dinner: Boiled dinner, vegetables, spinach and bread. Supper: Vegetable hash, bread and butter, tea.

Thursday—Breakfast: Eggs, bacon and potatoes, bread and butter, coffee. Dinner: Hamburg steak, vegetables, lettuce and bread, tea. Supper: Sauce, bread and butter, tea and cake.

Friday—Breakfast: Creamed salt codfish or fried fresh fish, potatoes, bread and butter, coffee. Dinner: Baked beans, fish, rareripes, bread and tea. Supper: Prunes, bread and butter, tea.

Saturday—Breakfast: Beef stew, rice with sugar and milk, bread and butter, coffee. Dinner: Pea soup, meat, bread. Supper: Baked beans, bread and butter, tea and cake.

J. Denny O'Neil Appointed State Highway Commissioner of Pennsylvania

The office of State Highway Commissioner of Pennsylvania, which was made vacant on Aug. 15 by the resignation of Frank B. Black, has been filled by the appointment of J. Denny O'Neil, of McKeesport, Pa.

Mr. O'Neil was State Insurance Commissioner at the time of his appointment as State Highway Commissioner. He took the oath of office on Sept. 6 and immediately entered upon his duties in connection with the highway work of the state. He served as Commissioner of Allegheny County for several years at the time that county began its road improvement work on a large scale.

Death of J. P. Beck

J. P. Beck, General Manager and former Publicity Manager of the Portland Cement Association, died of spinal meningitis at the Presbyterian Hospital in Chicago, Ill., last week after an illness of two days.

Mr. Beck was widely known in the cement industry with which he was connected in various ways for a number of years. He was at one time General Manager of the Cement Products Exhibition Co., under whose auspices the annual cement shows have been held, was a member of the American Concrete Institute, and for eight years Publicity Manager of the Universal Portland Cement Co., of Chicago, Ill.

Mr. Beck was born Jan. 27, 1866. He was a graduate of the University of Illinois, and a member of many clubs and other organizations, having been at one time President of the Illinois Club. He was Secretary of the Business Men's Forum, and a member of the Press Club, the Chicago Advertising Association, Bobolink Golf Club, Alpha Delta Phi, Phi Delta, and Phoenix Club. He was unmarried and resided for some time at the University Club in Chicago.

Contracts Awarded for Pennsylvania Highway Work

The following contracts have been awarded by State Highway Commissioner O'Neil for road work in Pennsylvania counties, on bids noted in "Good Roads" for Sept. 8:

Lackawanna County, South Abington Township, 7,821 ft. of bituminous concrete construction, to H. B. Sproul Construction Co., Inc., of Peekskill, N. Y., $51,218.60.

Fayette County, Washington Township, 6,513 ft. of vitrified block pavement, to Vicenzo Di Giorno, of Fayette City, Pa., $45,825.40.

Beaver County, Moon and Hopewell Townships, grading and draining 9,299 ft., to W. S. Morrison, of New Brighton, Pa. White and Big Beaver Townships, reinforced concrete pavement, 23,546 ft. to Peter F. Connolly, Elmira, N. Y., $145,198.70.

Bids were rejected for projects in East Taylor and in Jackson and East Taylor Townships in Cambria County, Cecil and North Strabane Townships in Washington County, South Fayette Township in Alleghany County, Hanover Township in Lehigh County, Manor Township in Armstrong County, Clinton Township in Butler County, and Abington, Upper Moreland and Upper Dublin Townships in Montgomery County. Action is pending on other bids.

Main Routes in Mexico Being Improved

The main highways of Colfax County, New Mexico, are receiving the benefits of a fund of $160,000, contributed by the government, the state, and the county. The Santa Fe Trail, which enters Colfax County by way of the Colorado state line and crosses the county to the Mora County line, is being surveyed, and will be resurfaced with gravel over about half of its length, but as a portion of the road has a natural rock foundation it will not be necessary, it is thought, to resurface the entire distance. The cost of its construction will be $120,000.

Plans for the building of the Taos-Cimarron Road, extending from Ute Park to Taos, 49 mi., have been approved at an estimated cost of $40,000, the United States Government to pay $20,000 on account of forest service, the state $10,000, and Colfax County $10,000. Gravel will be used for surfacing this highway, under which a rock bed exists for the greater portion of its length. Other important roads included in the county's road program are being improved.

Third Apportionment of Federal Funds Made by Secretary of Agriculture

The third apportionment of federal funds to the several states for use in the construction and maintenance of rural post roads has been announced by Secretary Houston. This is for the fiscal year ending June 30, 1919, and amounts to $14,550,000. The apportionment is as follows:

Alabama	$313,456.47	Nebraska	$319,445.25
Arizona	205,540.58	Nevada	193,229.82
Arkansas	250,018.47	New Hampshire	62,610.11
California	456,167.23	New Jersey	177,357.22
Colorado	257,278.92	New Mexico	238,634.55
Connecticut	92,216.45	New York	749,674.20
Delaware	24,411.99	North Carolina	342,556.47
Florida	170,723.88	North Dakota	229,585.91
Georgia	403,909.45	Ohio	558,043.42
Idaho	183,471.55	Oklahoma	346,489.34
Illinois	658,323.48	Oregon	236,332.74
Indiana	406,230.18	Pennsylvania	690,145.78
Iowa	434,653.61	Rhode Island	34,972.38
Kansas	429,131.88	South Carolina	215,014.08
Kentucky	292,984.62	South Dakota	243,175.61
Louisiana	203,755.29	Tennessee	340,663.51
Maine	144,807.42	Texas	876,986.70
Maryland	130,871.43	Utah	170,763.17
Massachusetts	221.261.85	Vermont	68,128.92
Michigan	435,356.37	Virginia	298,120.77
Minnesota	425.865.40	Washington	216,530.19
Mississippi	268,751.60	West Virginia	159,713.89
Missouri	508.603.98	Wisconsin	382,707.20
Montana	298.520.89	Wyoming	183,805.78

The first apportionment which covered the fiscal year ending June 30, 1917, amounted to $4,850,000, while the second, for the fiscal year ending June 30, 1918, was $9,700,000.

Trailer Law in New York State

On August 1 a motor truck trailer law went into effect in New York State.

By the terms of this measure, every owner of a trailer, not self-propelled but drawn by a motor vehicle, used for carrying goods, wares and merchandise on the public highways, is required to make application for the registration of such trailer in the manner provided for the registration of a motor vehicle, without the statement relating to motive power. The combined weight and carrying capacity of the trailer must be declared. The law provides that a trailer operated on the public roads of the state "shall have a distinctive number assigned to it by the Secretary of State and a number plate issued by such secretary with a number corresponding to that of the certificate of registration displayed and fastened in the manner provided for number plates on a motor vehicle," and that the operator of such a vehicle shall have with him the certificate of registration of such trailer. Number plate provisions are the same as those applying to motor vehicles, except that the word "trailer" must appear on the plates.

The annual trailer fees are: Combined weight of vehicle and carrying capacity, 2 tons or less, $5; 2 to 5 tons, $10; 5 to 7 tons, $15; 7 to 10 tons, $20; 10 to 14 tons, $30; more than 14 tons, $30, with an additional $5 for each ton in excess of 14 tons. If registered after Aug. 1 in any year, half the annual fee is charged.

The secretary of state has ruled that tractors and semi-trailers shall be regarded as one vehicle, and taxed according to the combined gross weight. The rule applies also to a tractor carrying no load but hauling a loaded semi-trailer.

Cambria County, Pa., May Bid on Road Work

Attempts by the State Highway Department of Pennsylvania to place under contract the reconstruction of state aid highway in Jackson and East Taylor Townships in Cambria County, Pennsylvania, resulted in the rejection of bids on the ground that they were excessively high. No bids were received in response to another call of the department. The matter was taken up with Deputy Attorney-General Keller, who has ruled that the county may bid for the work, and on a low bid receive the contract.

The Proposed Bond Issue in Illinois.

As noted in previous issues, in November, 1918, the people of Illinois will vote on a proposal to bond the state for $60,000,000 for the purpose of constructing a 4000-mile road system. Simultaneously with the measure which places this question before the people, a law was passed providing that the principal and interest of the above amount shall be paid by an increase in motor license fees beginning January 1, 1918. According to calculations made by W. W. Marr, Chief State Highway Engineer, the motor revenue will not only pay the $60,000,000 and the interest during the life of the 20-year bonds, $22,050,000, but will also yield the sum of $65,250,000 for state road maintenance and for aiding in the construction of other highways.

The bond measure provides for an issuance in 1920 of $10,000,000, and in each of the succeeding five years a similar amount. The increase in automobile rates will double the present rates by 1920, by which time it is expected that there will be a gradual increase in motor vehicles to 600,000. On the above calculations, it is shown that the motor licenses will produce a fund of $147,300,000 by the year of maturity of the bonds, 1944, to be applied in the payment of principal and interest and to road improvement in the following manner:

Year	Principal and interest.	State aid roads and maintenance.
1920	$ 2,750,000	$ 2,050,000
1921	3,016,000	2,184,000
1922	3,282,000	2,218,000
1923	3,548,000	2,252,000
1924	3,814,000	2,186,000
1925	4,080,000	1,920,000
1926	3,996,000	2,004,000
1927	3,912,000	2,088,000
1928	3,828,000	2,172,000
1929	3,744,000	2,256,000
1930	3,660,000	2,340,000
1931	3,576,000	2,424,000
1932	3,492,000	2,508,000
1933	3,408,000	2,592,000
1934	3,324,000	2,676,000
1935	3,240,000	2,760,000
1936	3,156,000	2,844,000
1937	3,072,000	2,928,000
1938	2,988,000	3,013,000
1939	2,904,000	3,096,000
1940	2,820,000	3,180,000
1941	2,736,000	3,264,000
1942,	2,652,000	3,348,000
1943	2,568,000	3,432,000
1044	2,484,000	3,516,000
Total	$82,050,000	$65,250,000

The Improvement of the State Road Between Cleveland and Akron, Ohio, is urged to meet the needs of heavy vehicular traffic, which is important to the industrial and commercial life of the two cities. It is stated that at a time last winter when the railroads were congested with freight, the transportation of materials to Akron by trucks was the means of keeping twenty thousand workers employed.

MEETINGS

Calendar of Coming Meetings

Sept. 18-20.—League of Iowa Municipalities.—Annual convention, Iowa City, Ia. Secretary, Frank G. Pierce, Marshalltown, Ia.

Sept 18-20.—League of Virginia Municipalities.—Annual convention, Lynchburg, Va. Secretary, L. C. Brinson, Portsmouth, Va.

Sept. 24-29.—League of California Municipalities.—Annual convention, Santa Rosa, Cal. Secretary, Wm. J. Locke, Pacific Building, San Francisco, Cal.

Sept. 27-28.—Montana State Good Roads and Automobile Association—Annual convention, Helena, Mont. Secretary-treasurer, Martin Martin, Anaconda, Mont.

Sept. 27-29.—Washington State Good Roads Association.—Annual convention, Bellingham, Wash. President, Robert L. Sprager, Artic Club, Seattle, Wash.

Oct. 9-12.—League of Kansas Municipalities.—Annual convention, Wichita, Kan. Secretary C. H. Talbot, University of Kansas, Lawrence, Kan.

Oct. 17-18.—League of Minnesota Municipalities.—Fifth annual convention, St. Cloud, Minn. Secretary-Treasurer, Richard R. Price, University of Minnesota, Minneapolis.

Oct. 29-30.—Oklahoma Society of Engineers.—Annual convention, Oklahoma City, Okla. Secretary-Treasurer, H. V. Hinckley, Oklahoma City, Okla.

Nov. 19-24.—City Managers' Association.—Annual meeting, Detroit, Mich. Secretary, W. L. Miller, City Manager, St. Augustine, Fla.

Nov. 21-24.—National Municipal League.—Twenty-third annual meeting, Hotel Statler, Detroit, Mich. Secretary, Clinton R. Woodruff, 703 North American Building, Philadelphia, Pa.

Jan. 15-17, 1918.—Virginia Good Roads Association.—Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

Joint Convention of County Engineers and Commissioners of Washington.

The counties of the state were well represented at the annual convention of the County Commissioners and the County Engineers' Associations of Washington, held at Spokane last week, as previously noted in "Good Roads." The number of delegates registered on the first day exceeded the entire attendance at any previous meeting of the associations.

Outside of the formal business of each body, the delegates met in joint session for the discussion of topics relating chiefly to highways. Both the commissioners and the engineers heard the address of Geo. F. Cotterill, Chief Engineer of the State Highway Commission, on state highway policy.

D. H. White, County Engineer of Pierce County, presented the report of the joint committee on standard forms for cost accounts for highway construction and maintenance. Prof. L. V. Edwards, of Washington State College, emphasized the importance of subgrades in his discussion of road types. B. J. Finch, of the United States Office of Public Roads and Rural Engineering, advocated longer tenure of office for engineers, and that it should be made "reasonably certain." He believes that the engineer should be appointed, and not elected for short terms, and that more thorough preparation for the profession of highway engineer should be made. H. G. Porak, Assistant State Highway Commissioner, discussed procedure under the permanent highway laws.

An automobile trip over the roads of Spokane County was a feature of the convention. The closing business was scheduled for today.

American Association for the Advancement of Science

The annual meeting of the American Association for the Advancement of Science will be held at Pittsburgh, Pa., late in December. Matters of special interest to road builders are handled by Section D, Engineering.

League of California Municipalities

A program of wide interest to municipal workers and students is offered by the League of California Municipalities at its twentieth annual convention at Santa Rosa, which will occupy the greater part of a week, opening on Monday, Sept. 24, and closing Friday, Sept. 28. The program is diversified by a number of social features.

Gov. Wm. D. Stephens, of California, on Tuesday morning will explain why the state is interested in better municipal government. In the afternoon, Max Thelen, President of the California Railroad Commission, will speak on "Grade Crossings Within Municipalities." At this session the actual accomplishments of California City Planning Commissions up to the present time will be set forth in reports of officials of the California Conference on City Planning which will hold its annual meeting at Santa Rosa during the same period.

At the session of the Department of Engineers, Councilmen and Street Superintendents on Wednesday morning, there will be talks by exhibitors, followed by addresses, including "Redding's New Lighting System," by E. A. Rolison, City Electrician, and a symposium on "The Advantage of Planting Flowers instead of Grass in Parking Spaces."

"The Police Power and Control of Streets by the Governing Bodies of Municipalities of this State," "Some Interesting Problems Confronting a New Municipality," and "Establishment of Grades in Street Improvement Work," will be handled respectively by City Attorneys, W. P. Butcher, of Santa Barbara, John J. Mazza, of Corte Madera, and D. J. Hall, of Richmond, on Wednesday morning, at the session of the Department of City Attorneys. A number of other interesting topics will be heard during the morning, including a symposium—"Keeping the Records under the '1915 Bond Act'".

A street dance on the new pavement on Fourth St., as a means of testing its smoothness and to celebrate the completion of the work will be given Wednesday evening.

Thursday's sessions will include the following: "How Santa Rosa did its Own Street Paving," D. W. Cozad, Street Commissioner of Santa Rosa; "Wasting Money on Street Pavements," D. W. Perry, City Councilman of San Anselmo; "Experience of the Highway Commission with Different Types of Pavement"; "The Comparative Cost of Oil Macadam with Pavement Having a Cement Concrete Base"; "Liability of a City for Trees and Other Obstruction in Streets," City Attorneys of Palo Alto and Alameda; "Disposition of Fines under the Motor Vehicle Act"; "The Limit of the Discretion Allowable to the Superintendent of Streets in Specifications for Street Improvement under the Improvement Acts," Geo. A. Work, City Attorney of Rio Vista; "The Policy of

Using Sign Posts or Iron Buttons at Street Intersections," a symposium, and "How the League May Increase Its Benefits to Municipalities," a symposium.

The convention will be brought to a close on Friday by the election of officers, selection of next meeting place, and other business, and a grand barbecue at Asti, 25 mi. above Santa Rosa, at the headquarters of the Swiss-Italian Colony. The trip will be made by automobile.

Meridian Highway Association

The annual convention of the Meridian Highway Association was held recently at Wichita Falls, Texas. John C. Nicholson of Newton, Kan., was reelected president, D. E. Colp, Secretary of the Texas State Highway Commission, was reelected vice president and G. A. McNaughton of San Marcos, Tex., was elected secretary-treasurer.

The annual convention of the Southwest Trail Association, really a subsidiary of the Meridian Highway Association, was held at the same time and place. Judge J. A. King of Albany, Tex., and Judge Russell of Baird, Tex., were reelected president and secretary-treasurer, respectively.

Trans-Alleghany Good Roads Association

At White Sulphur Springs, W. Va., on Sept. 8, the Trans-Alleghany Good Roads Association held its third annual convention. Geo. W. Stevens, President of the association, who is also President of the Chesapeake & Ohio Railway, presided. A. D. Williams and T. S. Scanlon of the West Virginia Highway Commission were in attendance, as were a number of other persons prominently identified with highway building or development, among them being Former Governor W. A. MacCorkle, who is vice president of the association. Mr. Williams spoke on the progress made in West Virginia in the construction of "Class A" roads.

Representatives of the counties traversed by the Trans-Alleghany Highway and the Midland Trail were present and submitted reports showing the improved mileage on these routes, and what was required to complete them.

At the annual meeting of the postal and rural mail carriers of Missouri, which was held at Jefferson City on Aug. 10 and 11, considerable time was devoted to discussing the question of improved roads.

At the annual convention of the Union of Canadian Municipalities held at London, Ont., Aug. 27 to 29, the proposal of a national highway across the Dominion to be built as a memorial of the fiftieth anniversary of confederation, was indorsed.

PERSONAL NOTES

Charles B. Stowell, former City Engineer of Rockford, Ill., died in that city on Aug. 10. Mr. Stowell performed important research work of a geological nature in the vicinity of Rockford.

R. E. Spear has resigned from the City Engineering Department of Flint, Mich., and is acting as Division Engineer for Black & Veatch, consulting engineers, of Kansas City, Mo., who are building the army cantonment at Little Rock, Ark.

S. J. Humes, County Engineer of King County, Washington, will hereafter supervise the construction of drainage projects in the county, by the terms of a resolution passed by the county commissioners. It has been found that in some cases engineers employed for this work disregarded its effects upon the highways.

Arthur Kneisel, National Treasurer of the American Association of Engineers, died recently at his home in Chicago, Ill.

O. M. Darling, of Fort Wayne, Ind., is in charge of engineering work in connection with the laying of 22,000 sq. yd. of concrete pavement in Lakewood, N. J.

E. J. Smith who has been engaged as engineer on highway building in Meigs County, is now in charge of road work in Fentress and Morgan Counties, Tennessee.

Charles Bartholet, a former engineer of the Washington State Highway Commission, has been appointed Assistant State Hydraulic Engineer. His office is at North Yakima.

Henry Souther, at one time Consulting Engineer of Cleveland, Ohio, who recently received a commission as major in the United States Signal Corps, died at Fort Monroe on Aug. 15.

Benj. F. Latting who has been engaged for several years on highway bridge work for the Indiana Bridge Co., of Muncie, Ind., has been appointed an aeronautical mechanical engineer with the United States Signal Service at Large, Washington, D. C.

E. C. Francisco, former Assistant Professor of Civil Engineering at the Agricultural and Mechanical College of Texas, has been commissioned a second lieutenant in the Engineer Officers' Reserve Corps and has been ordered to Fort Leavenworth.

B. K. Coghlan has resigned as Associate Professor of Highway Engineering at the Agricultural and Mechanical College of Texas to become a captain in the Engineer Officers' Reserve Corps. Professor Coghlan has been ordered to Fort Leavenworth.

F. H. Zouck, Chairman of the Maryland State Roads Commission, has been ordered by Governor Harrington to take over the work of clearing the army camp site at Camp Meade, Md., formerly in charge of Major W. W. Crosby, who, according to report, will be promoted to regular service in the United States Army.

Ralls and Ripley Counties, Missouri, will hold elections on road bond issues in the near future. The Ralls County election has been called for Friday, Sept. 21, the amount of the proposed issue being $250,000. Tuesday, Oct. 2, is the date of the election in Ripley County, and the amount, $200,000.

A Survey Between Lowell and Belding, Mich., has been ordered by the State Highway Department for the purpose of determining a route for a state trunk line highway which it is proposed to construct between the two points. The road would provide a continuous improved route between Grand Rapids and Belding.

New York State Convicts are engaged in the construction of the Racquette River Road between Childwood and Hollywood, in the Adirondack Mountains. About 35 inmates of Auburn Prison are employed. The work is being done with a fund provided by the Town of Colton, St. Lawrence County and the state.

The Utah Better Roads Association has instituted a movement for putting the main transcontinental highways crossing the state in condition for tourist travel. According to the plan, a committee composed of four persons living on or near these roads will report their condition to the organization, for the aid of county commissioners and the state road commission.

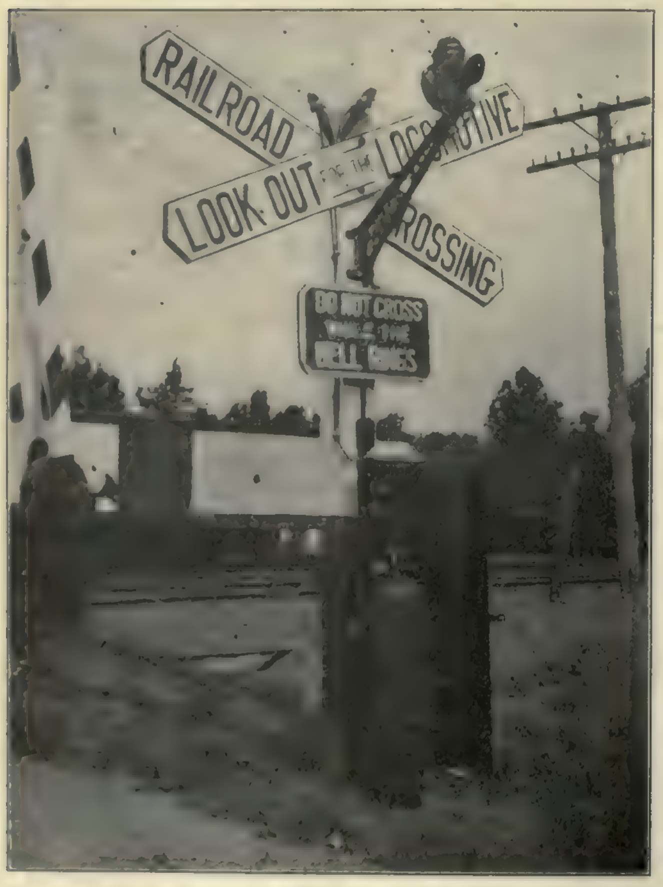
Pleasure Touring by Automobile in Wisconsin is to be accompanied by the collection of farm produce, if the plan advanced by the Good Roads Association of the state in a recently issued bulletin is followed. This means of securing products from the farms for individual consumption is expected to relieve railway transportation and help to solve the problem of distribution. There are 150,000 automobiles in the state.

EQUIPMENT — TRADE — MATERIALS

New Device for Illuminating Warning Signs at Grade Crossings

A device for illuminating warning signs at railroad and highway intersections and for providing an additional warning light has recently been put on the market. One of them in service at a grade crossing is shown in the accompanying illustration.

The outfit includes an acetylene lamp, gas tank, supporting arm and operating mechanism, the latter including, in some cases, the necessary electrical connections with the tracks The lamp is made of cast iron and is 15½ in. high, over all, and about 6½ in. diameter. It is carried on an iron bracket bolted to the upright post of the warning sign and so placed as to bring the lamp a little above the center of the sign and about 30 in. distant from it. A clear lens, 8½ in. in diameter, is set in the lamp on the side toward the sign and a 5-in. red lens is set in the opposite, or back, side.


RAILROAD CROSSING
LOOK OUT FOR THE LOCOMOTIVE
DO NOT CROSS WHILE THE BELL RINGS

"A. G. A. RAILWAY GRADE CROSSING SIGNAL" INSTALLED AT A WARNING SIGN.

At the back of the post is a heavy sheet iron housing in which the acetylene tank, pressure gauge, pressure regulator and piping are contained. The housing is provided with a door that can be locked to prevent interference with the tank and mechanism. In the illustration, the door is shown open. The acetylene container is a 12x36-in. seamless steel cylindner packed with "A. G. A. porous mass." It weighs 210 lb. empty and 225 lb. fully charged and has a capacity of 225 cu. ft of acetylene.

By means of an automatic device attached to the lamp, the light is made to flash, lighting up the warning signboard and at the same time, by means of the red signal at the back, warning anyone approaching the crossing. With only this equipment, the flasher operates continuously. The device is also furnished with attachments by means of which the flasher is operated only while a train is in the block in which the sign is situated. This type is equipped with a magnet contained in a cast iron casing, separate from the lamp, and the necessary track connections. A train entering the block starts the flasher which continues to operate while the train is in the block. The mechanism is so arranged that any accident to the track circuit or the local circuit will release the magnet, starting the flasher.

It is claimed that the device will make the usual warning signboards at grade crossing more serviceable at night than by day, that the cost of operation is low, and that it is so constructed that any failure will be on the side of safety. It is strongly built and can be attached to existing signs without altering their construction.

The device is known as the "A. G. A. railway grade crossing signal," and is manufactured by the A. G. A. Railway Light & Signal Co., of Elizabeth, N. J.

Record Time Made on Cantonment Road Building

The building of an asphaltic concrete highway in connection with the army cantonment near Louisville, Ky., was recently completed in record breaking time. The road, about 6 mi. long, and 18 ft. wide, containing 63,360 sq. yd. of Trinidad asphaltic concrete laid on a concrete base, was built in 63 working days. One mile of the road was over a 4-ft. fill, and it was necessary to haul and crush all the stone used in the work.

A traffic count was made immediately upon the completion of the road which showed that 4,000 vehicles, most of them motor trucks and wagons carrying loads of from 1 to 5 tons, passed over it during the first hour.

The Asbestos Protected Metal Company of Pittsburgh, Pa., has announced the opening of a sales office in Cincinnati, Ohio. The office will be situated in the Union Central Building and will be under the direction of J. C. Lathrop.

The Fuelling & Krudop Construction Co., of Fort Wayne, Ind., has been incorporated in the amount of $25,000, to do a general construction and paving business. The directors of the company are Fred H. Fuelling, George H. Krudop, and Charles W. Fuelling.

The Blaw-Knox Co. of Pittsburgh, Pa., has announced that T. M. Avery, formerly one of its New York City representatives, has been placed in charge of the company's San Francisco office. Mr. Avery succeeds Edward M. Ornitz, who has been commissioned a first lieutenant in the Engineer Corps.

A recent publication (Bulletin 70-D) issued by the Sullivan Machinery Co. of Chicago, Ill., is devoted to illustrated descriptions of Sullivan rock drills. The bulletin is 6x9 in. in size and comprises 48 pages. A general description of the construction of the company's drills occupies the first few pages and is followed by detailed descriptions of different models. Tables of weights and dimensions are included and a few pages are given to descriptions of accessories. The bulletin is well printed on especially good paper.

GOOD ROADS

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New Series, Vol. XIV

NEW YORK, SEPTEMBER 22, 1917

Number 12

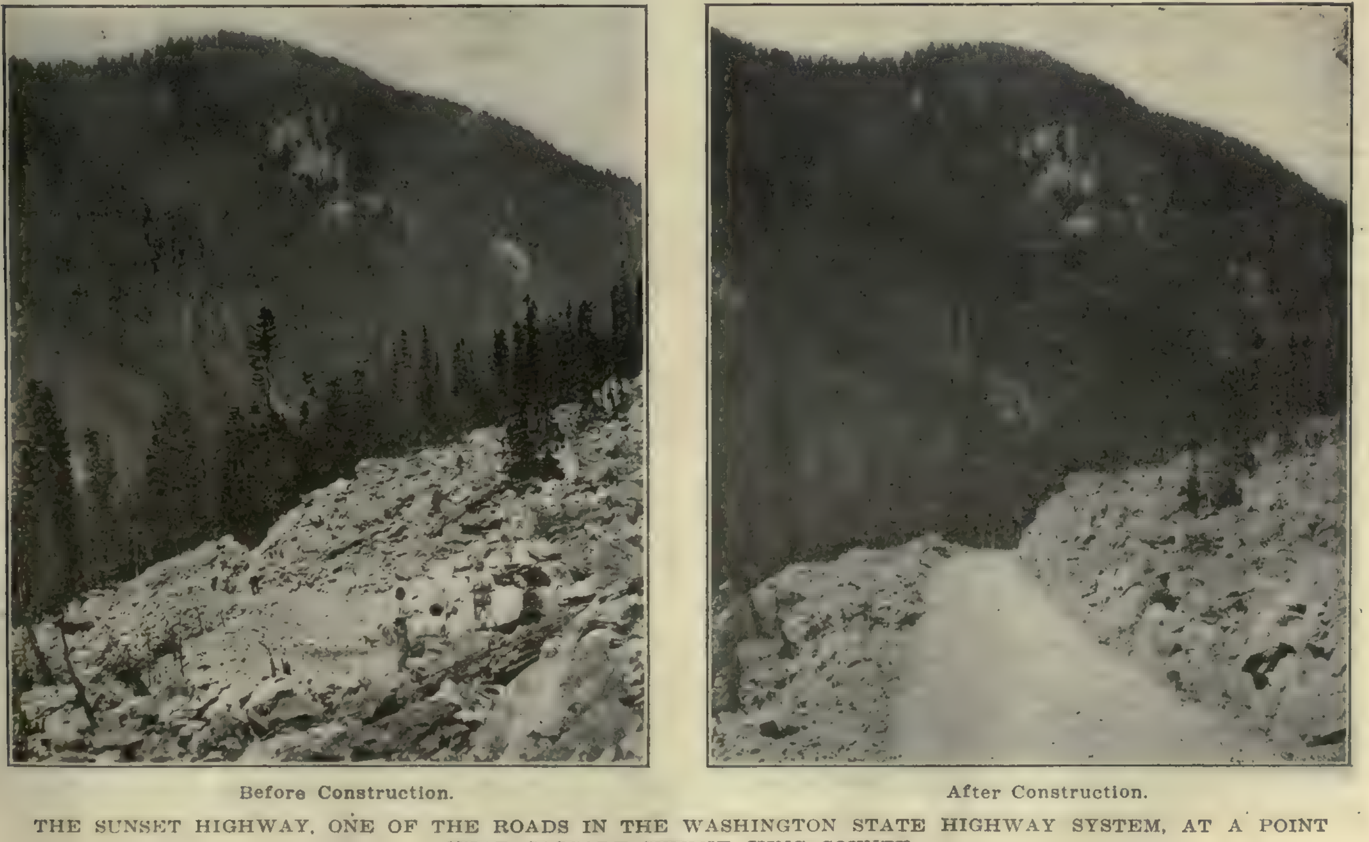
State Road Work in Washington

By GEORGE F. COTTERILL*

The State of Washington is in the fifth year of consecutive progress on a well-defined, systematic state and county program of permanent improvement of the main highways. Since 1913 this program has provided for annual state levies of $2,500,000 for the construction of a comprehensive system of state trunk highways connecting the various portions of the state. In most cases there are also great scenic highways which attract an increasing tourist travel. Certain principal county highways are also included in this improvement program. The State Highway Department is responsible for carrying out the construction program, either by direct execution or by supervision over work done under county authority.

Supplementing this state-county program, similar permanent construction of other main county highways has been progressing during this five-year period at the rate of about $1,000,000 per year with funds derived from bond issues authorized by vote of the people in 6 of the 39 counties. This is expended entirely under the supervision of county commissioners and engineers, and, in most cases, for paved highways in accordance with a county program approved by the people in voting the bonds.

In addition to this continuing investment in permanent improvement of the designated system of state highways and main county road systems, already exceeding $15,000,000 since 1913, there is also an annual expenditure within the 39 counties and their hundreds of road districts, aggregating $4,500,000, for the construction and maintenance of county roads and bridges, both on main routes and on the thousands of miles of tributary roads. This money is derived from county and road district tax levies, and is expended entirely under county authority and supervision. It may be estimated that about one-third of this total, or perhaps $1,500,000 per annum, is expended in construction along permanent lines on the more important county roads. The remaining two-thirds, or about $3,000,000 annually, is applied to the maintenance and repair of roads and bridges of all classes, and particularly to that class of partial or



Before Construction. After Construction.

THE SUNSET HIGHWAY, ONE OF THE ROADS IN THE WASHINGTON STATE HIGHWAY SYSTEM, AT A POINT NEAR CASCADE SUMMIT, KING COUNTY.

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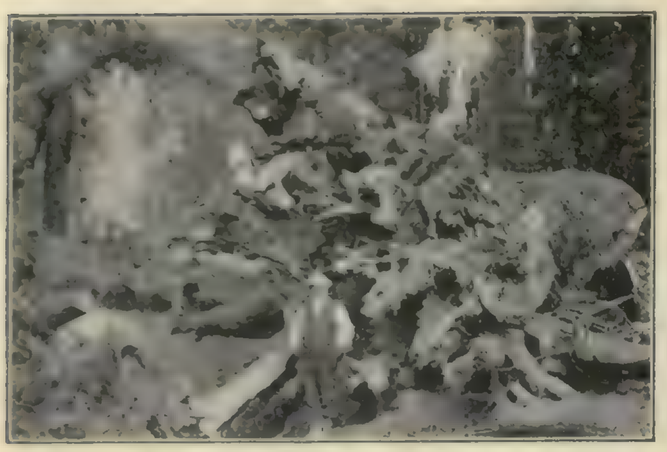
*Chief Engineer, Washington State Highway Department. Former Mayor of Seattle, Wash.



ONE OF THE INCIDENTS OF CLEARING AND GRUBBBING —OLYMPIC HIGHWAY.

casual construction along the large mileage of tributary roads, which is equivalent only to maintenance and accomplishes little permanent result.

The revenues from motor vehicle licenses, fixed and collected by state authority, now exceed $500,000 annually, after providing all administrative costs. An increased schedule of fees, with the increasing number of vehicles, will almost double this revenue in 1918 and thereafter. This fund is apportioned by the state treasurer to the several counties for the maintenance of the permanently improved state and county highways. The State Highway Department defines the rules and regulations under which this maintenance is supervised by the county authorities, with a reserve enforcing power of direct maintenance by the state department in the event of any county delinquency.

The annual Washington highway program, therefore, includes, in round numbers, about $8,500,000 expended upon road construction and maintenance. This does not include expenditures in the incorporated cities which provide for their own street improvements, aggregating for all the cities more than $5,000,000 annually, by direct assessments upon abutting property benefited. Of the annual state and county budget for roads outside the cities, about $5,000,000 is expended for construction of permanent type along main highway routes, while about $3,500,000 is annually applied to general maintenance and to temporary construction spread over thousands of miles of tributary roads.

It required more than a decade of organized good roads agitation and education to develop public sentiment to the point of securing, by 1913, legislation and tax levies making possible the progress that has been described. A small start was made in 1905 with the establishment of a state highway department and provision for a cooperative state and county expenditure of about $100,000 annually on a defined state highway system. Each biennial legislature increased this program until, in 1913, the full measure was reached. This has been maintained through five years; it is assured for the sixth year (1918), and there is every indication of at least a four-year continuance thereafter. It will require about the ten-year period to carry forward to reasonable completion the improvement of the state highway system established in 1913, together with the harmonious development of the county systems of main highways where permanent construction is justified.

ON THE NATIONAL PARK HIGHWAY IN LEWIS COUNTY BEFORE CONSTRUCTION.

The noteworthy and gratifying feature is that public sentiment is so evidently satisfied with the thousand miles and more of permanent highway resulting from the past four years' expenditures, that there is apparent unanimity in support of a continuance of the program to its completion. Plainly the strongest argument for more and better roads is the amplifying object lesson of "good roads" spreading out before the people's eyes and meeting their daily needs and desires. The eloquent contrasts in traction and convenience between the old style roads and the sections permanently improved, are especially convincing in their appeal for continuing appropriations. "Good roads" are contagious.

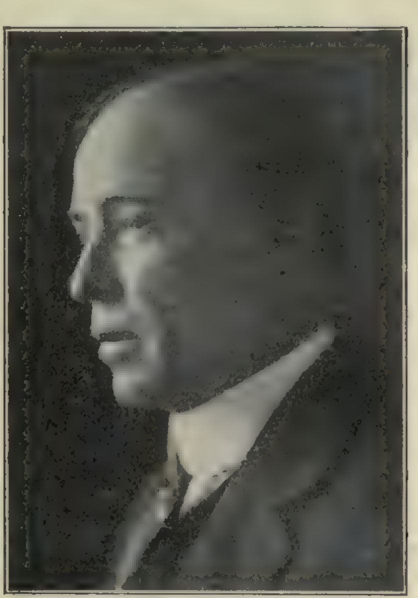
The State of Washington is roughly rectangular in outline, with an extreme width of 350 mi., east and west, and an extreme length of 235 mi., north and south. It contains 69,127 sq. mi. of land and water area. The Cascade Mountains traverse the state from north to south, leaving about two-fifths of the state's area to the west and three-fifths to the east. The range is a continuous mountain barrier from the Columbia River at the south to Canada at the north. The general crest line is from 6,000 to 8,000 ft. above sea level, with passes varying from 3,000 to 6,000 ft. in elevation, and perpetual snow peaks reaching an altitude of from 9,000 to 14,500 ft. The western Cascade slopes are steeper than those on the easterly side and break away within 20 to 30 mi. of the crest, to the lower levels adjacent to Puget Sound. As the eastern slopes cover from 30 to 50 mi. the Cascade mountain area includes a belt 50 to 80 mi. in width across the state. Most of this area is within national forest reserves.

MARION STEAM SHOVEL AT WORK ON STATE ROAD NO. 23 IN SPOKANE COUNTY.

The Puget Sound Basin is an approximate north and south bisection of the northern part of the area west of the Cascades. Within the 10 to 20 mi. wide area skirting the east shore of Puget Sound and extending east to the Cascade foothills and extending for 200 mi. from the head of the Sound at Olympia northward to the British boundary are the principal commercial and industrial cities and more than half of the state's population of a million and a quarter.

West of the sound and the Hood Canal, which is the westernmost ramification of the intricate system of tidal inlets commonly known as the Puget Sound Basin, is the Olympic Peninsula. This area, averaging about 75 mi. square from Hood Canal to the Pacific Ocean, and from the Strait of Juan De Fuca southward to Grays Harbor and the headwaters of the various inlets of Puget Sound, is largely occupied by the Olympic Mountains, 5,000 to 8,000 ft. in elevation, from which hundreds of creeks and a score of rivers of considerable magnitude run north, east, south and west into the surrounding waters. Only a narrow bordering fringe of comparatively low land includes the limited settlements, with several cities and a large development of the lumbering industry in all its various forms. More than two-thirds of the peninsular area is within the limits of the Olympic Forest—largest among the national forests in Washington, and one of the greatest in the country.

GOVERNOR ERNEST LISTER,
Assist. State Highway Commissioner.


JAMES ALLEN,
State Highway Commissioner.

H. G. PORAK,
Assistant State Highway Commissioner.

GEORGE F. COTTERILL,
Chief Engineer.

Highway Officials of the State of Washington.

Between the Puget Sound section and the Columbia River, southwestern Washington is a broken area with Grays Harbor and Willapa Harbor opening from the Pacific Ocean and receiving rivers from the eastward. The Columbia River receives many tributaries from the northward, chief of which is the Cowlitz River. This river, flowing southerly, in connection with the northward course of the Columbia from the vicinity of Portland, before its last westward bend toward the Pacific, establishes the natural route for traffic between the Columbia River and Puget Sound.

The section east of the Cascades, generally known as eastern Washington, is irregularly divided by the Columbia River into two main areas. This river, after a circuitous course of several hundred miles in British Columbia, enters the United States about 25 mi. west of the northeast corner of Washington, and after a southwesterly course for a hundred miles, makes the "Big Bend" to the westward, describing an irregular half-circle in its next three hundred miles. At its westernmost bend near Wenatchee it approaches within 50 mi. of the Cascade Mountain crest line, but returns to the eastward more than 60 mi. Near Pasco it receives its largest tributary, Snake River, and thence, like a great elbow, it turns to the westward, passing through the Cascade Range in a 50-mi. gorge that defies all world comparisons for scenic grandeur. In the final hundred miles to the Pacific it spreads its waters over miles of adjacent lowlands, with many side channels, sloughs and bayous. The river is the boundary between Washington and Oregon for the 250 mi. westerly from Snake River.

The topography of eastern Washington is dominated by the Columbia River and varied by its many tributaries. Kettle and Okanogan Rivers flow south from British Columbia; the Methow, Chelan (lake and river), Wenatchee, Yakima and Klickitat Rivers drain the eastern Cascade slopes; the Pend Oreille, Spokane and Snake Rivers enter Washington from the eastward and discharge into the Columbia. These principal tributaries and many of lesser magnitude, with intervening mountain ranges, rolling hills and great plateaus, make eastern Washington a region of varied topography, which overcomes the otherwise monotonous effect of a generally open country, in strong contrast with the densely timbered region west of the Cascades.

The Cascade Mountains form a climatic division of the state. Western Washington has an annual precipitation varying in different localities from 30 to 110 in. Eastern Washington has large areas in which there is only a normal rainfall, and, as a whole, will scarcely average 25 in. annual precipitation, largely in winter snowfall. Western Washington has mild, damp winter months with only slight frosts and infrequent snow, except on the Cascade Mountain slopes and foothills. Eastern Washington has more of a conventional northern winter, with clear, cold weather, frosts and snow—about a mean between the mild winter west of the Cascades and the rigorous climate east of the Rocky Mountains.

A 75-FT. CONCRETE ARCH BRIDGE ON STATE ROAD NO. 23 IN SPOKANE COUNTY.

In similar contrast the western Washington summers are characteristically cool, while the warmer climate of the interior dominates eastern Washington. Cloudiness is a prevailing condition in the ocean-influenced region between the Pacific and the Cascades, while sunshine is the rule east of the Cascades.

These climatic conditions have great influence on road making and road maintenance. Practically every sort of road building material is found in Washington, and usually in fair proximity to construction needs. Varying types of roads must economically be considered for the contrasting local conditions as well as needs of traffic. In western Washington there is a first cost of $1,500 to $3,500 per mi. for the clearing of timber and grubbing of stumps and roots before grading of a permanent highway begins. In eastern Washington this cost item is usually negligible. The soil conditions are radically different, the typical western Washington road being impassable through the "rainy season," winter, unless graveled, macadamized or paved. The eastern Washington roads are in many localities on good natural road material which requires only proper shaping, slight surfacing, adequate drainage and timely maintenance. The summer conditions of dust in certain sections of eastern Washington make graveling, macadamizing or paving just as necessary as they are to overcome winter mud conditions on roads in western Washington. Averaging these varying conditions and localities, it has been demonstrated that good roads—that is, roads permanently located, properly graded, adequately drained, of standard width (not less than 24 ft.) of roadbed, with not less than 12 ft. surfaced with gravel or crushed rock; and with permanent type culverts and other structures—will cost approximately $5,000 per mi. in eastern Washington and $8,000 per mi. in western Washington. On the mountain roads where heavy rock work is encountered this mileage cost will vary from $10,000 up to $25,000.

A 280-FT. STEEL TRUSS BRIDGE ON STATE ROAD NO. 5 IN LEWIS COUNTY.

Pavements of almost all types have been constructed to the extent of about 200 mi. outside of the cities. Compared on a basis of a 16-ft. width of pavement, their cost has varied from about $12,000 per mi. for concrete up to $24,000 for a standard brick pavement on concrete base. (These costs are now increased from 20 to 25% under 1917 war conditions.)

The accompanying map of Washington shows the comprehensive system of "state highways" as defined by the Legislature. Their various degrees of improvement are indicated by markings explained in the "legend." These highways include about 3,000 mi. of the main traffic and scenic routes connecting all parts of the state and joining similar highways in adjacent states and provinces.

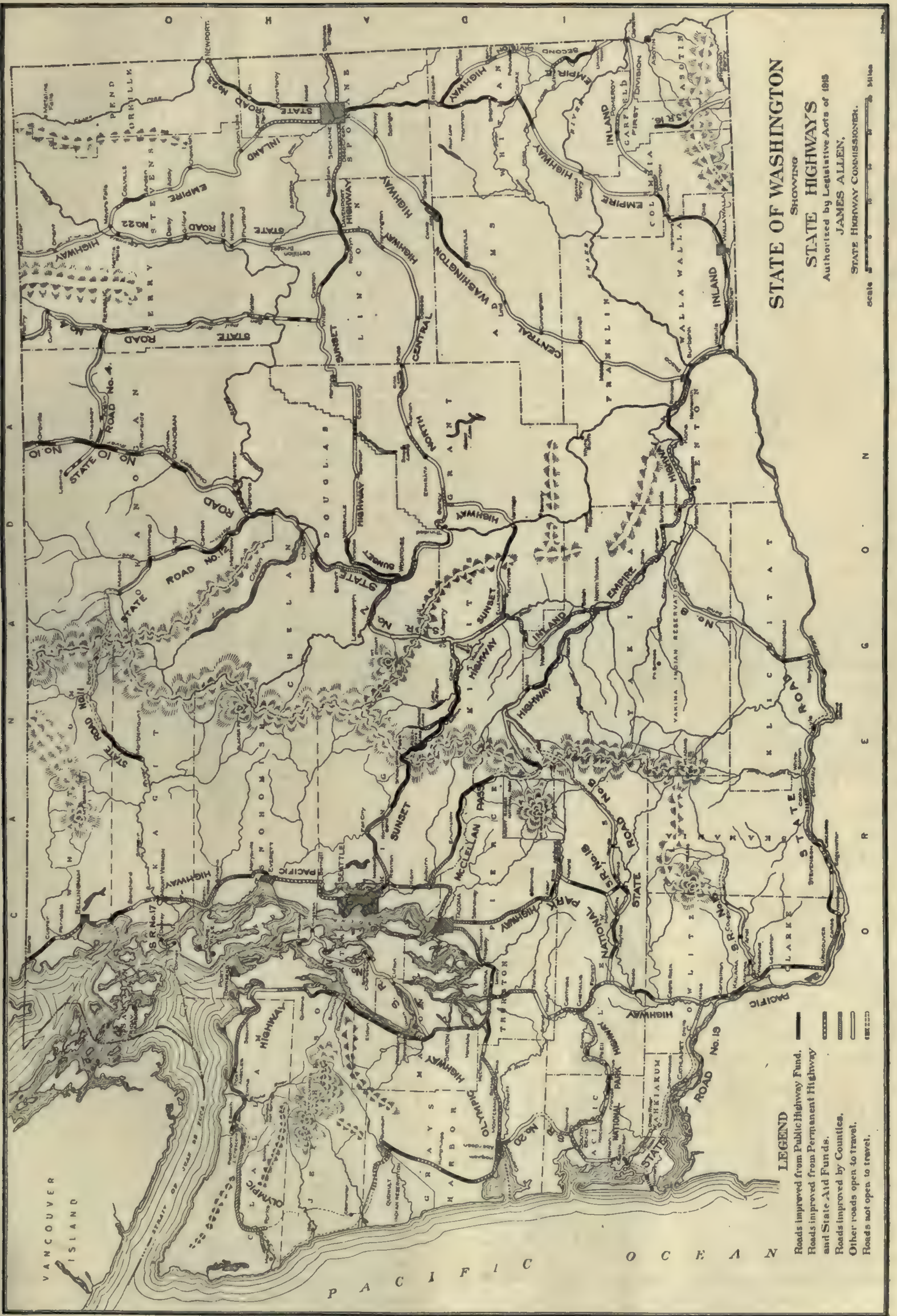
These highways and the work done in their improvement may be described as follows:

Pacific Highway—This commences at Blaine on the Canadian line and extends southerly along the east shore of Puget Sound and through the southern portion of western Washington to the interstate bridge over the Columbia River, between Vancouver, Wash., and Portland, Ore. It is part of a main highway route along the Pacific Coast from British Columbia through Washington, Oregon and California to the Mexican boundary. It is the traffic route for tourist travel attracting thousands annually; a military route of strategic importance. It passes through Bellingham, Everett, Seattle, Tacoma, Olympia, Centralia, Chehalis and Vancouver and has a total length, including the mileage in cities it passes through, of 323 mi.

VIEW ON A COMPLETED SECTION OF THE NATIONAL PARK HIGHWAY IN LEWIS COUNTY.

During the four years from 1913 to 1916 inclusive, $612,767 was expended upon this highway from state appropriations. More than half the route is now hard-surfaced, and with the exception of about 35 mi., in a half dozen scattered sections, the remainder is permanently constructed and surfaced with gravel or crushed rock. State appropriations for 1917-18 are $449,603, to which $135,000 will be added under the federal aid road act, and the counties are making large provisions from their resources. According to the program, the uncompleted mileage will be permanently improved by 1918, and at the rate the counties are extending the pavement, there will be a continuous paved highway from the British boundary to the Columbia River within six years.

Sunset Highway—This is the main east and west highway across the state, connecting with the Pacific Highway near Seattle, crossing the Cascades through the lowest mountain pass (3,000 ft. altitude), using the state bridge over the Columbia River at Wenatchee and continuing eastward across the "Big Bend" plateau to Spokane and on to the



MAP OF WASHINGTON SHOWING THE ROADS IN THE STATE HIGHWAY SYSTEM.

Idaho boundary. It is 391 mi. long. About $150,000 had been expended on this route by the state prior to 1913. In the four years that followed $653,238 was spent from state appropriations, and large amounts by the counties. Much of the route is permanently improved and it is passable throughout the entire length. The state has provided $270,375 for 1917-18, to which $137,500 of federal aid funds and over $100,000 of county funds will be added. This is expected to complete the highway as a permanently improved road, with gravel or crushed rock surfacing, entirely across the state.

Inland Empire Highway—This traverses the "Inland Empire," commencing at a point on the Sunset Highway about 50 mi. east of the Cascade summit, extending southeasterly along the Yakima River Valley to the Columbia, thence easterly down the east bank of the Columbia about 15 mi. and up the Walla Walla Valley, through the city of that name, and thence northeasterly through the wheat growing section of the state, to Spokane, and thence northerly to the upper Columbia River section and the British boundary. Two extensions from this route make direct connections from the west and from the north to the Idaho boundary near Lewiston. The total length of the Inland Empire highway and extensions is 567 mi.

Since 1913 the state has expended $546,374 in permanent improvement of this route, to which the counties have added a greater sum. Appropriations of $248,598 are now being expended on the 1917-18 program, to which at least $30,000 of federal aid will be allotted. With the county work also planned for this highway, fully 500 mi. will be completed along permanent lines by the end of 1918.

Central Washington Highway—This is a connecting highway following the Northern Pacific Railway from the Inland Empire Highway at Pasco to Spokane, a distance of 150 mi. Prior to 1917, the state had expended only $38,302 upon this route, but has provided $110,000 for the 1917-18 program. The counties traversed have also done considerable work, especially near Ritzville and Spokane.

McClellan Pass Highway—When completed this will be an additional road across the Cascade Mountains. Starting from the Pacific Highway at Auburn, it half circles Mount Rainier along its northern and eastern base, crossing the range at an altitude of 5,400 ft., and descends the eastern Cascade slope to the Inland Empire Highway at Yakima. It will be 135 mi. long, will provide an even more scenic route than the Sunset Highway across the Cascades and will be the shortest route from eastern Washington to the National Park. Previous to 1913 the state expended $112,891 upon it, and since that year the state has spent $257,481. For 1917-18 work there is available $101,750 from state funds and $17,625 from Yakima County. To this it is expected that $119,375 of federal aid will be added, as the entire uncompleted section lies within the Rainier National Forest. If federal aid be granted the road should be completed by 1919.

National Park Highway—This extends from the Pacific Highway at Tacoma to the southerly section of the Rainier National Park, from the park to a connection with the Pacific Highway near Chehalis, thus affording a direct park route for tourists from the south. From Chehalis, another section of the highway extends southwesterly to Willapa Harbor. The route includes 196 mi. of highway. In addition to very large expenditures by Pierce County between Tacoma and Mount Rainier, including about 20 mi. of pavement, the state expended $229,059 for work prior to 1917, and has provided $149,850 for the 1917-18 program. Pierce and Lewis Counties will add substantially to this, and Pacific County voters have just bonded their county for nearly $250,000 for improving the section leading towards the ocean beach.

Olympic Highway—This road, as may be seen by reference to the map, completely encircles the Olympic Peninsula. It is 350 mi. in length. The state has expended $480,652 upon this highway and the counties traversed at least as much more. There is a "missing link" of about 55 mi. on the west side of the circuit. For 1917-18 work there is available $219,376 from state funds, to which $35,000 of federal aid will be added. Most of this will be used for improving bad sections of grade in the existing passable road, and it is expected that the western gap will be reduced by only about 10 mi. The completion of the road must await the 1919-20 appropriations.

The seven highways thus far described are legally designated as "primary state highways" and embrace 2,112 mi. of the most important traffic and scenic highway routes in the state. In addition there are other state highways that have been designated as "secondary." Brief notes on the work done and expenditures made follow; the routes are adequately shown on the map:

North Central Highway—This is an alternative for the portion of the Sunset Highway from the Columbia River, 110 mi. easterly to Davenport. It is a passable trunk road as a result of county work, but thus far has received no state expenditures.

State Road No. 4—This road is 115 mi. long from the Sunset Highway north to the British boundary, and 45 mi. from Republic west to the Okanogan. It has received improvement to the extent of $76,121 of state funds, and at least half that amount additional by Ferry County in the section between Republic and British Columbia. The 1917-18 program provides $15,000 of state funds and $15,000 federal aid for improving the summit section in the Colville National Forest west of Republic.

State Road No. 5—This will make a third trans-Cascade Mountain road, using the Carlton Pass south of Mount Rainier, with elevation of 4,300 ft. This trans-mountain road will be 76 mi. long from the National Park Highway to the McClellan Pass Highway, and with its connections will afford a route 150 mi. long from the Pacific Highway near Chehalis to the Inland Empire Highway at Yakima. It has had expended upon it $116,696 of state funds and a considerable amount by Lewis County. Plans are now in hand for improvements costing $30,000 in 1917-18. Half of this sum is expected as federal aid in the Rainier National Forest, through which most of this route lies. There are poor, but passable roads over more than half of this route, but the Cascade summit section, including about 20 mi. on the west side and 15 mi. on the east side of the pass, is only a trail. It will require about $500,000 to complete a permanent highway over this route.

State Road No. 18—This is inserted here out of numerical order, because it is only a 7-mi. "Y" connection from State Road No. 5 to the northward course of the National Park Highway at Morton. It has already received improvement to the extent of $19,685 of state funds, and provision is made for its completion in 1918 with $20,000 of state, Lewis County and federal aid funds.

State Road No. 7—This is in fact, though not by official designation, a part of the Sunset Highway route. It is 50 mi. long, about 32 of which are included in what is known as the Blewett Pass Road, the remaining 18 being in the Wenatchee Valley. The road was built with steep grades and a narrow roadbed 20 years ago, but has received substantial improvements in recent years by the two counties within which it lies. Provision is now made for $70,000 expenditure in 1917-18, from state, county and federal aid appropriations. This will replace all the remaining steep, narrow portions of the mountain section with 6% maximum grades and a 16-ft. roadbed, thus practically completing the highway along permanent lines.

State Road No. 8—This is the Columbia River Road, extending along the north bank of that river, from the Pacific

(*Continued on page* 159.)

Road Improvement in Whatcom County, Washington

By CHARLES A. LINDBERY*

The most northwesterly portion of the United States, namely Whatcom County in the great State of Washington, is making a name for itself by the construction of good roads. The question of good roads is constantly kept before the eye of the people and they breathe, think and talk good roads the year round. The heavy rainfall and wet season of the winter makes an all-year road an imperative necessity. The dairy industry is one that must be taken care of daily and as Whatcom County boasts of being almost the leading county of the United States in dairying, good roads must necessarily be provided to take the products to market.

The mild winters mean muddy roads and muddy roads are very expensive luxuries. Gravel roads on main trunk lines have been found to not stand up under the strain of heavy, constant wear and the maintenance on them runs into almost the cost of rebuilding every three years. The people in the communities finally decided that a permanent relief was a crying need and the paved country road is the result. The experiment has been such a success from every point of view that now the farmer, business man and laborer are all clamoring for hard-surfaced roads. The ones who in the past had fought the hard-surfaced road are now the most enthusiastic supporters of the policy of building them.

NORTHEAST DIAGONAL ROAD, WHATCOM COUNTY, WASHINGTON—CONCRETE PAVEMENT.

ONE-TEAM LOAD ON AN IMPROVED ROAD IN WINTER—GUIDE MERIDIAN ROAD.

Whatcom County in looking about for the character of road to adopt, selected the concrete road as the type most desirable from the standpoints of economy, durability, tractive power and cost of maintenance. The width selected was 16 ft., with a 2-ft. gravel shoulder on either side, making a 20-ft. roadbed.

At first mistakes were made in construction, due to many causes, among them being improper care of subgrades, poor materials, improper mixing, improper curing, and poor drainage and inspection. Like every radical change in any particular line the concrete road was at first regarded with fear and trembling, due to the human element, but thanks to exhaustive and intelligent experimenting, the concrete road can now be laid with assurance of good results.

Prior to the year 1917 there had been laid 18.84 mi. of concrete paving, 16 ft. in width. The majority of this paving is in first-class condition. There were laid 1.6 mi. in 1913, 1.86 mi. in 1914, 6 mi. in 1915 and 9.38 mi. in 1916, making a total of 18.84 mi. The thickness of the pavement varied from 5 to 5½ in. at the sides and 6½ to 7½ in. at the center. The mixes were of different proportion from 1:3:5 to 1:1:2.

The mixture finally adopted as giving the best results is 1 of cement, 2 of sand and 3 of gravel. The mixing is carried on for not less than 12 revolutions of the mixer or one minute of time. The water is accurately measured and the mixture made a quaking mass. The abuse of water in concrete has resulted in a great many failures and too much attention cannot be given to this particular item. The thickness of the pavement, as adopted, is 5½ in. at the sides and 7 in. at the center with a straight line crown.

The year 1917 has seen 29.01 mi. of concrete pavement initiated and put under contract, with the prospect of having 30 mi. additional built during 1918. The law under which the system is being worked out is the Donahue Road Law as amended by the State Legislature of 1917. It is one of the simplest and best laws ever devised for country road improvement.

The general idea in the past has been to improve all roads and not assess any special benefit to the abutting property. This idea is unquestionably unfair, for the man living directly on an improved road gets the most benefit from it and he is not asked to pay any more than the man living forty miles away from the road. The Donahue Road Law rights this injustice and the man who gets the direct benefit pays for it as he should.

The law provides for a district 2 mi. wide on each side of the improved road. This area constitutes the direct district and 25% of the total cost of the improvement is spread over it. The assessments are according to benefits and are made by a board of three appraisers appointed by the board of county commissioners. The district, if regular, is generally laid out in zones of ½ mi. each, making four zones on either side of the road. The percentage as used in some districts is 45% for the first zone, 30% for the second zone, 15% for the third zone and 10% for the fourth zone. As a basis for comparison, take 1 mi. of road: The estimated cost this year is $17,500 per mi. for a paved road 16 ft. wide. The direct district would pay 25% or $4,375. The acreage in the direct district would be 2,560 acres. If the assessment were spread equally over the entire area, the cost per acre would be $1.709.

On a basis of four zones of 45%, 30%, 15% and 10%, the first zone would pay $3.08 per acre; the second zone $2.06 per acre; third zone $1.03 per acre, and the fourth zone $0.68 per acre. The percentage of the zones might vary with the judgment of the appraisers, but the method of arriving at the conclusion would be the same. Where districts overlap the law provides a method which causes no

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*County Engineer, Whatcom County, Bellingham, Wash.

A WHATCOM COUNTY ROAD BEFORE IMPROVEMENT—THIS ROAD IS NOW BEING PAVED.

ROAD READY FOR PAVEMENT—SHOWING SUPERELEVATION AND FORMS ON CURVE.

injustice to any one. The payment for the direct district is made over a period of 20 years, giving ample time to complete any payments due.

The county at large bears 50% of the cost of the improvement, which is raised by taxation. No more than 4 mills can be assessed for any one year. A county having a valuation of $25,000,000 can raise $100,000 per year, which will take care of $200,000 per year of road work. The road districts or township through which the road passes bear 25% of the cost, which is raised by taxation along with the road district levy.

The county portion of the cost of improvements, or 50%, can be spread over a period not exceeding five years. The road district portion, or 25%, can be spread over a like period.

By improving the roads in the county in a permanent manner the county road levy and the road district levy can be gradually lessened, because, the main lines of travel being taken care of, less money will be needed.

An improvement can be initiated under this law by two or more persons living in the district. The valuation of the property signed for must be $10,000 per mi. and $5,000 of this amount must be signed up for with property inside the direct district. An owner of $30,000 worth of property could sign up for 6 mi. of road inside the district.

After the petition is signed, it is presented to the county commissioners who have it checked up for valuation. A hearing is then set to hear protests against the proposed improvement. This hearing must be not less than 15 days and not more than 60 days after the petition is presented. The engineer presents at the hearing a preliminary estimate of the cost of the proposed road. After the hearing the county commissioners may pass a resolution for the improvement of the road and five days after the resolution is passed, bids can be called for. After the resolution is passed the commissioners may appoint the appraisers, who go upon the ground and assess the benefits to the direct district. They make their report within 60 days of their appointment.

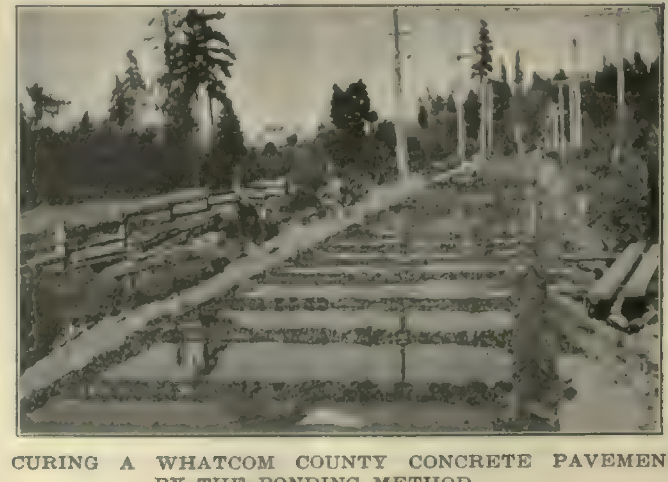
After the report of the appraisers is filed, the county commissioners set a day for hearing on the report and every person in the direct district is given a chance to be heard. The commissioners equalize any injustice found and the assessment is then spread upon the tax rolls of the county to be paid according to law.

If speed is wanted and the engineer is physically able to, a contract can be let 43 days after the petition has been filed. Petitions for 72 mi. of road were filed in Whatcom County between April 1 and April 23, 1917, and 29.01 mi. of road, or the road program of the year, had been let by June 15. This means quick, hard work for the engineering force, but as the law was not signed by the Governor of Washington until March 7, the county was powerless to proceed.

Plans and specifications are now ready for 30 mi. more which may be called for early in the coming year. It is advisable to have the petitions presented in the fall of the year so as to give the engineer a chance to carefully plan the work and allow bids to be called the first of the year.

An innovation being tried in the Northwestern States and in Whatcom County, is the belt finish of the surface. This finish takes all the waves out of the surface of the pavement and preserves a true cross section. It is accomplished by a heavy vulcanized belt, 8 in. wide, and the work can be finished by green men. The belt is held down tight against the ribbons and dragged over the pavement.

FINISHING A CONCRETE PAVEMENT BY THE BELT METHOD—WHATCOM COUNTY.



CURING A WHATCOM COUNTY CONCRETE PAVEMENT BY THE PONDING METHOD.

The men at first were inclined to not want it at all and difficulty was encountered in getting the desired results, but after the first few days the men could not be induced to abandon it. Speed is another item accomplished in finishing by the belt method, the finishing being kept up close to the mixer.

Whatcom County with its 270,100 sq. yd. of pavement under construction and as many more in view for the coming year is justly proud of its record. It has not been necessary to go through the fight always found in a bond issue, nor has it had to resort to an extra heavy tax to secure the results.

The county commissioners' and county engineer's offices have been regular headquarters for inquiries from all parts of the United States concerning the system under which the roads are being improved, and delegations of prominent road officials are constantly visiting the county getting first-hand ideas. It is safe to predict that in the near future most of the roads in all parts of the Northwest will be improved under this law.

Good roads mean prosperous, contented farmers and are one of the best advertisements any county can have. Whatcom County's slogan is "Good Roads and Everything Else Will Come."

The Construction and Maintenance of Highways in King County, Washington

By CARL E. MORFORD and C. P. MOWRY*

King County, comprising an area of 2,152 sq. mi., including Vashon Island with an area of 38 sq. mi., is situated in the west central part of Washington, forming an irregular rectangle extending east and west an average of 55 mi. and north and south 45 mi. The western boundary of the mainland portion is Puget Sound, a deep inlet from the Pacific Ocean, and the eastern limit of the county is formed by the summit of the Cascade Mountains.

REDMOND-ISSAQUAH ROAD, KING COUNTY, WASHINGTON—GRAVEL ROADWAY.

NORTH TRUNK ROAD NEAR SEATTLE—BRICK PAVEMENT BUILT IN 1913.

The topography of the county is extremely diversified. The Cascade Mountains, with their foothills occupy the eastern half, with many peaks over 5,000 ft. in elevation, running to heights exceeding 7,000 ft. along the divide, containing several small glaciers and many mountain lakes, with hundreds of streams descending steep narrow canyons. This district is drained by five principal rivers, with their branches. These run through valleys 2,000 to 3,000 ft. in depth, with narrow floors and subject severe floods, thus presenting an ample supply of problems to the highway locator.

The western part of the county is generally comprised of glacial deposits of gravel, clay and sand, forming a rolling plateau country with elevations of from 300 to 600 ft. Through this plateau the rivers issuing from the mountains to the east have carved deep valleys of a broad U section, with fertile bottom lands and steep sides. Many small lakes are scattered about over this section, with creeks draining into the main rivers through narrow and deep gulches.

Lake Washington, the largest fresh water lake in the county, 18 mi. long by 3 mi. in average width, forms the eastern boundary of the City of Seattle. This lake with its water surface 12 ft. above mean sea level in Puget Sound, with which it is connected by a modern ship canal permitting ocean vessels to enter, is destined to be an important factor in the development of the county and its system of highways.

The climate of the county is mild and equable, considering its latitude. Long periods of severe cold are practically unknown in the inhabitable portions and excessive heat in summer is equally rare. Precipitation is seasonal in character, mainly occuring from October to May with November as the wettest month and July and August as periods of drought. The annual precipitation ranges from about 36 in. at Seattle to upwards of 100 in. along the summits of the Cascades, and occurs mainly as rain in the lower and western portions and as snow in the mountains. In 1916 the depth of snowfall at Snoqualmie Pass, at an elevation of 3,000 ft., was 567 in.

Lumbering, farming and mining are the main occupations of the people outside of the City of Seattle, and in importance rank in order as named.

Good road gravel and rock suitable for crushing are plentiful throughout the county.

The subject of roads received little attention prior to 1905. At about that time interest began to awaken under the impulse of the automobile enthusiasts and a short stretch of water bound macadam was laid south of Seattle, under the supervision of a government road engineer. That object lesson stimulated interest and since then hard-surfaced roads have grown increasingly popular.

The accompanying diagram graphically shows the mileage of the different types of pavement laid in the county, with the year of construction, and is extended to include the contracts that are expected to be completed this year. Most of the paved roads, outside of cities, are in the eastern part of the county and most of the graveled roads are in the eastern and central portions. With the growth of paved highways, the earth and gravel roads have not been neglected, and it is estimated that there are 1,100 mi. of roads surfaced with gravel or crushed rock, and 425 mi. of graded and drained earth roads.

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*Principal Assistant Engineer and Office Deputy, respectively; County Engineer's Office, Kings County, Seattle, Wash.

The earlier hard-surfaced roads were built with a width of pavement of 14 to 16 ft. The Warrenite surfacing was all 16 ft. in width and, with the exception of one road, with a 4-in. concrete base, was laid upon a base consisting of 6 in. of crushed rock. After five or six years of wear, the maintenance of this class of road is becoming an item of importance, as the weight of traffic is rapidly increasing. The edges are beginning to crumble at the gravel shoulders, due to frequent turnouts of passing cars.

The present tendency is to construct all pavements in the county with a width of 18 or 20 ft. and the latter width is giving much better satisfaction.

While nothing new or unusually striking has been done in the way of freak types or specifications, the endeavor being to attempt to obtain the best results possible by careful inspection, selection of materials and close attention to details, the following notes on the types recently built may be of interest.

Three types of brick roads have been built this year. One road south from Seattle, expected to carry very heavy traffic, has a brick payment 20 ft. wide supported by 5-in. flush curbs cast monolithic with the 6-in., 1:3:6 concrete base. A sand-cement cushion, 1:5 mixture, 2 in. in depth, was used and the standard No. 1 paving blocks with 5/32-in. lugs were grouted with cement sand grout, 1:1, mixed dry. The earth shoulders were 3 ft. in width and the bottom of ditch in excavation was 4 ft. from the shoulders. An expansion joint, 1 in. thick, was provided at each curb, but no transverse joints were used. The cost of this paving, including smoothing and preparing the subgrade, but excluding items of drainage and railings, was $29,200 per mi. The contract was let late in 1916. It may be said that to date the omission of transverse expansion joints has resulted in no trouble because of cracking.

This is the most expensive type of road the county builds. The majority of brick roads have been built of No. 2 brick or brick blocks upon a concrete base usually 5 in. thick. The cement-sand cushion used on this type is 1½ in. thick to accommodate the greater irregularities of the No. 2 block. The form of curb and general specifications are identical with those for the No. 1 brick, except that the earth shoulders are in general 2 ft. in width. The cost per mi. of pavement for this type, reduced to standard width of 20 ft., including preparation of the subgrade, was quite uniformly $26,000 per mi. from 1912 to the middle of 1914, declining quite sharply to $20,000 in June and July, 1916, the dates of letting the final contracts for this class of work. The decline in price of brick pavement was partly due to the competition set up by other forms of road material, notably one-course concrete.

One road of monolithic brick construction, 9.6 mi. in length with a width of 20 ft., has been recently completed from the south limits of Seattle to the small town of Des Moines on the shores of Puget Sound. The specifications differ in no important respect from those adopted by the National Paving Brick Manufacturers' Association. The pavement is of vertical fiber brick, 2¾ in. thick, laid upon a ¼-in. cement mortar cushion, supported by a 1:3:6 concrete base 3 in. thick at the edge and 5½ in. at the center. The cost per mi. of this pavement was very nearly $21,500.

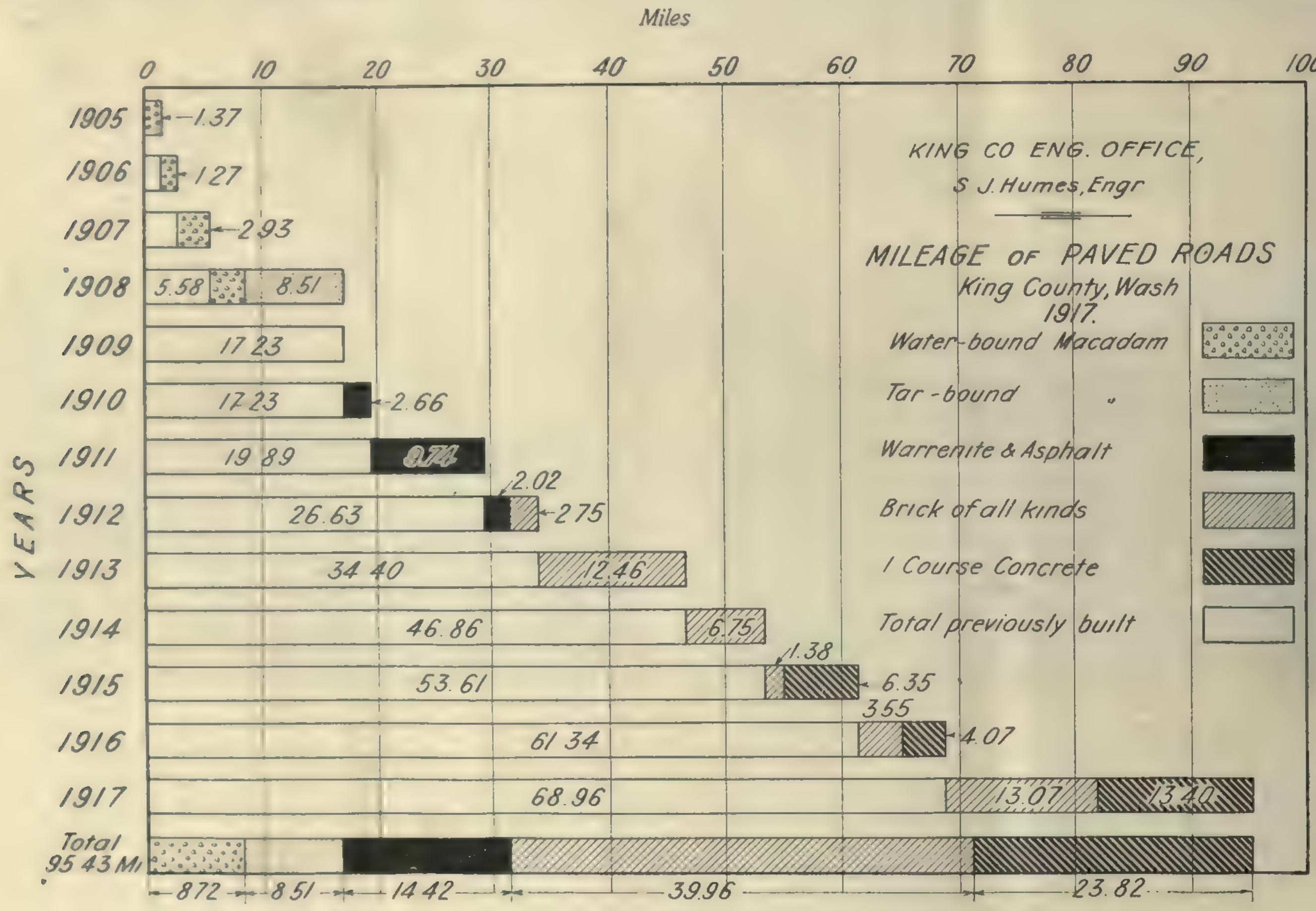


DIAGRAM SHOWING MILEAGE OF IMPROVED ROADS BY YEARS—KING COUNTY.

Just at present, the one-course concrete pavement, 18 or 20 ft. in width, constructed with flat sub-base with a thickness at the edge of 5½ in. and at the center of 7½ in., with 3x6-in. timber flush curbs left in place, composed of 1:2:3 mixture, is having its place in the sun. While in all recent work, bids have been taken on various forms of brick as well as on concrete, the difference in cost has been such as to influence the authorities to decide in favor of the latter. In general the specifications in use are the same as those advocated by the cement manufacturers, the American Society for Testing Materials, and the U. S. Office of Public Roads, with minor changes suggested by local conditions and experience. The roads resulting therefrom are giving good satisfaction to date. Concrete roads are showing a rise in cost, however, and the price per mi. of the 20-ft. width, including the preparation of sub-base, has risen quite uniformly from $11,500 in May, 1915, to $17,500 in July and August of this year.

The modern gravel roads as now built, when well maintained, are quite popular and carry a rather heavy traffic throughout the pleasure riding season. Those now constructed are provided with a 6-in. gravel surface, 16 to 18 ft. in width, placed in two layers and rolled. The earth shoulders are of a minimum width of 2 ft., and the ditches are 4 ft. wide. With few exceptions, the foregoing is the standard construction for the county.

FALLS CITY BRIDGE OVER SNOQUALMIE RIVER, KING COUNTY, WASHINGTON—SEE TEXT.

The location of highways depends on many factors, but where roads already exist the existing right of way is used whenever possible, departing from it only to secure an easier grade or a better line. Where the engineer is free to suit himself, however, effort is made to secure easy curves and grades not exceeding 5%, and it is notable that except in a few instances the main highways do not exceed 6% and then only for short stretches. Curves as sharp as 30 deg. are seldom used on new location. All paved roads are superelevated on curves exceeding 3 deg., the amount of superelevation varying with the curvature and the central angle. In addition, the roadways are widened from 2 to 4 ft. on turns.

The matters of drainage and protection are receiving much attention. It is felt that in a county where humid conditions prevail for a good part of the year the disposal of ground water should be continually in the mind of the road builder. Drains are provided wherever springs and seepage waters are suspected. Cross drains and culverts are placed to convey water from the up-hill to the lower side of the road at intervals of about 300 ft. on side-hill work, and every ravine crossed is made to do its duty as a potential water carrier. Tile drains in gravel filled ditches paralleling the road are liberally used. All farm entrances crossing the side ditches are provided with culverts and graded to meet the shoulders of the road, while timber stops, 6x6 in. and 18 or 20 ft. long, are placed next to the edge of the pavement to take up the impact of vehicles, entering or leaving the main road. Culverts have a minimum diameter of 8 in.and are usually of vitrified tile where sufficient cover is available, or of corrugated iron where the fill is very shallow. Larger openings, 2x2 ft. or over, are usually provided with reinforced concrete culverts.

REDMOND-ISSAQUAH ROAD—GRAVEL ROAD ON EMBANKMENT IN LOGGED-OFF COUNTRY.

Deep ravines are usually crossed by timber trestles, with roadways of the same width as the paved approaches. These structures are designed for a live load of a 15-ton truck in country districts and a 20-ton truck on main roads. Where built as a part of a paved highway, the deck is covered with a 4-in. course of asphaltic concrete, crowned in the center or with a uniform slope entirely across.

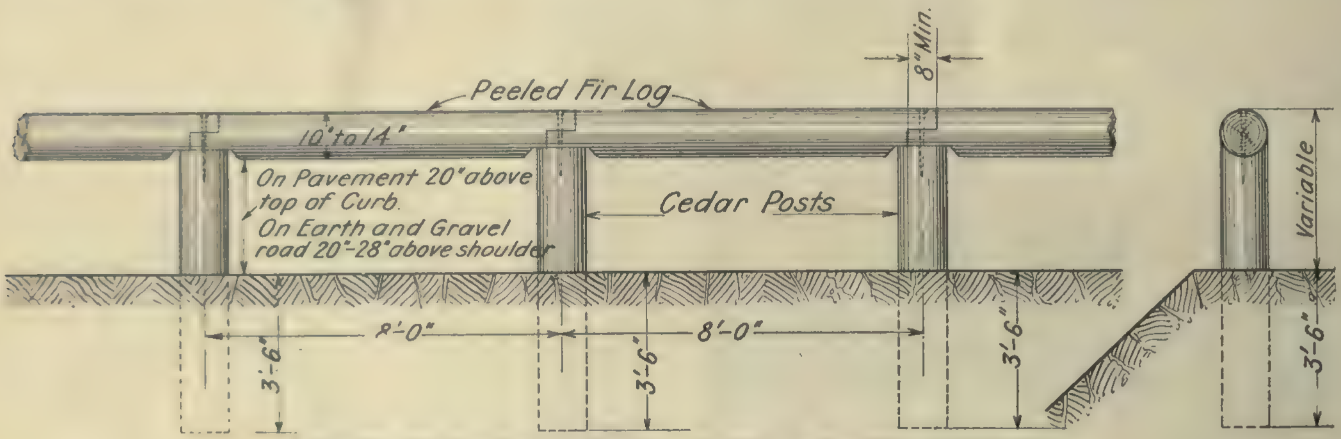
There are many river crossings in the county and the construction and maintenance of bridges is an important part of the work. The present practice is to construct more of the bridges of concrete and steel, and the concrete arch is becoming the favorite. Timber bridges are of course frequently built from motives of first cost, but the realization is growing that permanence and low maintenance costs are important factors. The most notable concrete bridge yet built in the county is the Falls City Bridge over the Snoqualmie River, on the Sunset Highway. The bridge has three spans of 97, 104 and 97 ft. each, with a clear width of roadway of 20 ft., and cost $36,900. A recent traffic count of a week's duration over this bridge gave a daily average of 721 vehicles.

Traffic throughout the county is mainly motor-driven, nearly all traffic counts taken this summer in June, July and August showing that about 98% of all vehicles are automobiles. Traffic on the paved roads, as may be expected, is heavier than on the graveled roads, and is heaviest on the

TIMBER BULKHEAD ON A SIDEHILL ROAD IN KING COUNTY, WASHINGTON.

main trunk roads running north and south between the cities of Everett in Snohomish County, Seattle in King County and Tacoma in Pierce County. The main brick road between Seattle and Tacoma had an average of 1,382 vehicles per day, while similar numbers were observed on the roads toward Everett. Secondary and gravel roads gave results ranging from 200 to 700 or more vehicles.

Funds for the county roads are derived from four sources, the road district fund, the road and bridge fund, the permanent highway fund and the bond issue. The first two are county funds administered by the board of county commissioners, and the necessary engineering work is done by the county engineer. The permanent highway fund is a state affair, administered by the state highway commissioner. Each county annually receives from the permanent highway fund an amount proportional to that which it pays into the tax levy for that purpose, and county commissioners designate the roads which they intend to declare as permanent highways and improve as such. Upon approval of such intention by the highway commissioner, plans and specifications and estimates of cost are prepared by the county engineer and forwarded to him for examination and approval, after which they are adopted by the county commissioners and bids called for. The engineering work and supervision of construction are done by the county engineer, and payments made by the state upon vouchers forwarded by the county authorities.


8" Min.
Peeled Fir Log
10" to 14"
On Pavement 20" above top of Curb.
On Earth and Gravel road 20"-28" above shoulder
Cedar Posts
Variable
8'-0"
8'-0"
3'-6"
3'-6"
3'-6"
3'-6"

DETAILS OF STANDARD TIMBER GUARD RAIL—KINGS COUNTY.

Permanent highways must comply with certain minimum requirements, such as a graded width of 16 ft. with proper drains, culverts and bridges, a surface of gravel, macadam or similar material 12 ft. in width, and a grade not usually exceeding 5% and an absolute maximum of 10%. It is well to state that practically all roads in the county now being built exceed the requirements.

Contracts must be let upon a lump sum basis, and this requires closer study of plans and conditions generally before letting of contracts.

A $3,000,000 bond issue was authorized by a county election in 1912, and money raised by a series of 20-year bonds, maturing in 1934, bearing interest at 4½% to 5%. This issue is practically expended now and was used mainly in opening up new highways wherever the development of the county seemed to require it. All bond roads when not paved were graded, drained and surfaced with gravel or crushed rock to a minimum width of 16 ft., and comply in every particular with the requirements for permanent highways.

The maintenance of roads other than state aid or permanent highways is in the hands of the road supervisors, who are responsible to the county commissioners, and the county engineer has no control over the method of carrying out the work. Permanent highway maintenance is provided for from state funds under the state highway commissioner. An engineer in each county, usually the county engineer, is designated as maintenance engineer. This is the first year this system has been in operation, but indications are that it will work very well. The work is turned over to one deputy who has organized his field and office force, outlined a method of attack and gone at it whole-heartedly.

The maintenance of paved roads has not proven so heavy a task as yet, because of the comparative newness of the work as a whole. Rather extensive stretches of Warrenite have demanded attention, and one brick road in particular has developed a large number of failures in the wearing surface. although it has not been in place more than three years. In general, the pavements are standing up well, and it is quite apparent that the better the drainage, the better the road is enduring. The maintenance department, realizing this, is devoting much effort to improving drainage wherever the need appears, feeling it a measure of economy. Gravel roads are constantly watched and dragging frequently resorted to. In fact, it is very true that eternal vigilance is the price of good gravel or macadam roads.

In round numbers the sums raised last year, exclusive of bond issue money, for the construction and maintenance of roads and bridges in King County were as follows:

Road and bridge fund	$276,000
Road district fund	264,000
Permanent highway fund	336,500
Permanent highway maintenance	75,600
Total	$952,100

Samuel J. Humes has been county engineer since January of this year and all engineering and maintenance work in connection with the county highways is under his direction, with Carl E. Morford as principal assistant. Richard V. Higbee is maintenance engineer, T. G. McCrory is bridge engineer, and C. P. Mowry is office deputy.

The Road from Denver to Littleton, Colo., 3.95 mi. in length, has received the approval of the Secretary of Agriculture as a federal aid project, and it is expected that its construction will begin as soon as definite plans can be agreed upon. The road will be built of concrete at a cost of $62,000.

Columbiana County, Ohio, according to a recent report, claims the longest continuous section of the Lincoln Highway to be improved this year. It is stated that 27 mi. of that road are being paved with brick and with concrete, at a total cost of approximately $500,000.

The Work of Clearing the Army Camp Site at Camp Meade, Md., has been placed under the supervision of the Maryland State Roads Commission. The site, which contains 7,000 acres, has been inspected by Chief Engineer Shirley of the commission. When arrangement was made for the state to clear the camp site, it was estimated that the work would cost from $100,000 to $150,000, but, according to report, the latter amount has already been spent on the work. Frank B. Beasman & Co. received the contract on a basis of cost plus 6%.

GOOD ROADS

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

SEPTEMBER 22, 1917

ROAD IMPROVEMENT IN THE STATE OF WASHINGTON

Much interesting and instructive information on the work of building a system of improved roads in the State of Washington is contained in the series of articles printed in this issue. The problem there is complicated by many of the conditions common to other localities and by others with which some of our readers do not have to contend.

Though past years have marked progress of no mean proportions, a great deal of work yet remains to be done. But during the past year, Washington, like many other states, has revised its highway laws, and is planning to continue its road betterments on an even larger scale. It has adopted a comprehensive program of development, including a classification of its roads and the planning of a system of main and tributary highways on which the efforts of the state are to be concentrated.

In addition to the state work there are in progress extensive county undertakings. These have entailed a total expenditure of fifteen millions of dollars since 1913, it is stated, and will continue.

Adding together the state, county and municipal expenditures gives a grand total of about thirteen and a half million dollars spent annually for road and street work in the state—a sum that compares very favorably with the total spent by some of the wealthier and more populous commonwealths.

Perhaps the most noteworthy phase of the Washington program is the preparation for providing adequate maintenance of the roads already improved and those to be improved in the future. The methods adopted are explained elsewhere. No state can hope to make progress in road betterment if this part of the work is neglected; and the workings of the Washington plan will be watched with interest.

No comment on the road situation in Washington would be complete without some reference to the Washington State Good Roads Association which meets in annual convention at Bellingham next week. This organization has worked indefatigably for the betterment of road conditions and deserves no small measure of credit for what has been accomplished.

WHAT THE FEDERAL AID LAW DOES NOT MAKE POSSIBLE

A somewhat mistaken idea of the real purpose of the federal aid road act seems to have found lodgment in the minds of some who should be better informed than they appear to be. A recent circular calls attention to an article in the June issue of the "Missouri Highway Bulletin," which, upon examination, proves to be a discussion of an article on "Good Roads and Army Transports," written by Gen. Wm. M. Black of the Engineer Corps, U. S. Army, and printed in "The Army and Navy Journal," in March of this year.

Though the matter comes up at this late date it may not be amiss to point out one or two misconceptions that appear to have crept in.

"It is obvious," according to Gen. Black, "when one stops to think of it, that if the construction of public roads under federal aid continues, without some eye to the possible use of those roads for military purposes, they will not be constructed in such a manner as to permit the transportation of the army and its supplies in time of great necessity."

Gen. Black is right unquestionably. It is sure that the roads will be useless for military purposes unless they are located and built with the demands of that service in view. And there is every reason for feeling that roads partly paid for from the federal treasury should be built, partly at least, for federal uses—the chief of which is the transportation of the military and its supplies. Nearly a year ago we advocated a course similar in many respects to that which Gen. Black feels is not being followed. In discussing the building of highways for coast defense it was pointed out that roads for such purposes ought to be laid out by the highway and military authorities, working together, and it was also suggested that on no other class of highways could federal funds be more fittingly employed.

But, while we suggested the propriety of using federal funds for such purposes, Gen. Black's article at least implies that the failure to use the available federal aid funds for roads especially adapted to military requirements is a failure to properly administer the federal aid law. With this we cannot agree.

The measure passed by Congress last year is just what it implies—a federal "aid" law. It is expressly stated in the title that it is an act to "aid the states in the construction of rural post roads," and while the addition of the ambiguous phrase "and for other purposes" might be construed as Gen. Black apparently does interpret it, it is still evident that the chief end of the law is to "aid" the states in the improvement of their own roads.

Gen. Black also complained that the Department of Agriculture had no right to make demands on any state and that the roads improved in different states were not properly coordinated.

In this, too, Gen. Black is undoubtedly correct. The power of the Department of Agriculture is small; it may approve or disapprove, but it is not empowered to initiate the improvement of any road or road system. But again, this seems to be in line with the apparent purpose of the act to provide aid for state projects.

In short the federal aid act does not contemplate the building of "national" or "federal" roads, and for that reason is of little use to the federal authorities in the present emergency or in preparation for similar emergencies in the future. It is purely a "federal aid" measure.

The Highway Law of Washington

The newest and perhaps the most important feature of constructive highway legislation in the State of Washington is embraced in the law providing for the maintenance of all primary highways, under rules, regulations and requirements prescribed by the State Highway Board. This law went into effect June 7, 1917, and the state now has more than 1,000 mi. of primary (main state) highways under monthly maintenance reports by the county engineers. This is the first attempt in the state to specify in detail the standards and requirements for proper road maintenance. An annual budget and monthly reports are the basic features of an original system of segregated cost accounts for the various types of road, which has been inaugurated for the purpose of securing adequate maintenance.

The work of maintaining primary highways is done by and under the county officials with state supervision, and may be "economically combined in supervision and execution with that of county highways, but separate costs and distributions of organization, working forces and materials must be provided for, so that the reports relating to the primary highways can be accurately and correctly prepared and rendered."

The board of county commissioners provides the organization, working force, equipment and materials, and may place the county engineer directly in charge of the work, or may appoint a special maintenance engineer whose duties may be combined with those of construction engineer. The rules require that every section of constructed primary highway within any county must be examined at least once a week, and immediately after each rainfall, and that the necessary work be done forthwith.

The intentions of the law are embodied in the rules, rgulations and requirements adopted by the State Highway Board, in which the terms "maintenance" and "maintain" are clearly defined and the standards of proper maintenance set forth. These call for the "continuous observation, care and upkeep" of drainage facilities, structures, roadbed, slopes, wearing surface, signs and safeguards, the "prompt removal of obstructions," "threatening trees, rocks or impending slides," the making of repairs and detours, attention to "springs, fountains and other watering facilities, and to rest and comfort stations" and other needs of travelers. Specific requirements as to dragging, rolling and preserving proper crown and grade up to the standard of original construction are included.

The State Highway Board is empowered to enforce all rules and decide all questions of standards of maintenance.

The system of maintenance accounting proceeds from the requirement for an annual budget, or estimate, itemized, complete, and separate for each section of road, but subject to modification in any essential particular by the board of county commissioners. The board must secure this estimate from the county engineer, or appointed maintenance engineer, on or before the last Monday in March for the ensuing year, April 1 to April 1. This "advisory budget" does not however relieve the county from expending a larger amount than the original estimate, if desirable. Monthly reports, or "segregated cost statements" are required from the county, or maintenance, engineer for each section of highway, and filed for comparison and carried forward as monthly drafts upon the approved annual budget.

The expense of maintaining primary highways is paid from the "permanent highway maintenance fund" of the county in which the road is located. If the fund is insufficient, a necessary amount is taken from the "permanent highway fund" belonging to the county; if the latter is insufficient or unavailable, the remainder may be paid out of the "general road and bridge fund" of the county. On the other hand, if the maintenance fund is more than adequate to meet the cost of maintaining a primary state highway within any county, or if there is no such highway in the county, the surplus may be used for maintaining or improving roads on the route of primary state highways.

The "permanent highway maintenance fund" is created by a section of the motor vehicle laws of the state, which have been completely revised. The revenue from this source now exceeds $500,000 per annum, after deducting the cost of administration. The fund will be greatly increased in 1918 by an increase in fees through legislative action.

The schedule of fees under the new motor law is as follows:

Motorcycles	$ 2.50
Automobiles:	
25 hp. or under	5.00
25 to 40 hp	7.50
40 hp. and over	10.00
For hire per hp	1.00
Motor trucks and trailers:	
Capacity ½ ton and under	5.00
" ½ to 1 ton	10.00
" 1 to 2 tons	15.00
" 2 to 3 "	25.00
" 3 to 4 "	35.00
" 4 to 5 "	50.00
" 5 to 6 "	100.00
" 6 to 7 "	250.00

No license may be issued for a truck with a carrying capacity greater than 7 tons, nor for a fee less than that required of an automobile of equivalent horsepower.

Auto-stages and trailers:	
For hire, per hp	$ 1.00
In addition for each rated passenger-capacity, per passenger	2.00
Dealers license fees:	
Motorcycles	3 00
Motor vehicles, regardless of hp. or capacity	25.00
Additional license plates (except. motorcycles)	5.00
General fees:	
Duplicate number plates, each	1.00
Duplicate year plates, each	.25
Dealers' duplicate number plates, each	2.50
Duplicate motor vehicle license, each	.50
Transfer of motor vehicle license, each	1.00

Half the license rates are charged on vehicles registered after Sept. 1 in any year.

The construction of primary state highways is under the immediate supervision and control of the State Highway Board. In the matter of road work in the state the state highway commissioner is authorized to cooperate with road supervisors, county commissioners, and other public officials, furnish plans and directions for highway improvement and render such assistance as may be requested. He may require such officials to report all available information relating to the improvement in their respective localities. Either contract or day labor may be employed in state road construction. If the latter is used, the law requires that the labor be performed by convicts as far as available or advantageous. A monthly statement of the available number of convict laborers is made by the board of control to the state highway board.

Other laws that unite to form the legal structure for highway progress in Washington are those providing for the classification of highways as primary or secondary roads, the "public highway fund" appropriated biennially by the Legislature for the construction of state highways, the law under which a state tax amounting to approximately $1,500,000 yearly is levied for counties, and the assessment law for highway improvement at the expense of the land benefited.

County government and responsibility for highway improvement is vested in the board of county commissioners, elected by the people in November of even years. The Washington law also provides for township organization by an electoral vote. If no such organization exists, the county commissioners divide the county into road districts of such size and form as will permit personal oversight and management by one road supervisor. The county engineer is elected at the general election for a term of two years.

All county road construction and repairs costing less than $2,500 may be done under the direction of the commissioners and the county engineer; work estimated at more than that sum is let by contract on plans and specifications prepared by the county engineer.

The "general road and bridge fund" and the "road district fund" are provided by taxation. The county may also issue bonds for road improvement, following the general methods of procuring funds by this means. The only assessment plan for improving county roads which is applied to any extent is contained in Chapter 72, revised laws of 1917, which provides for the assessment of corporations, companies, persons and property particularly benefited by the improvement. One-half of the whole estimated cost of the work is assessed against the county, one-fourth against the road district or township and one-fourth against the lots or lands lying within the proposed improvement boundary. [This is covered fully in "Road Improvement in Whatcom County, Washington," by Charles A. Lindbery, printed on other pages of this issue.]

No application of the law providing for the development of arterial highways, extending county roads within cities to the business centers, has been made, although considered by highway officials as a helpful and necessary piece of legislation. A county is required to build or improve any permanent highway through the corporate limits of any city of the third or fourth class.

Under the "permanent highway law," which has been in operation six years with slight changes, $1,500,000 is collected yearly by means of a state tax of 1½ mills, and placed to the credit of the counties in proportional amounts, for the improvement and maintenance of permanent (state aid) highways. These improvements are practically all initiated by the board of county commissioners, without any petition or subsequent assessment. [Biennial appropriations for road work in Washington were the subject of an article in "Good Roads" for April 7, 1917.]

The Legislature of 1917 passed an act assenting to the provisions of the federal aid road law and directing the state officials to do what is necessary to comply with its requirements.

The primary and secondary highways of the state, as classified by recent legislative action, are described in the article, which appears in this issue, entitled, "State Road Work in Washington," by Geo. F. Cotterill, Chief Engineer of the State Highway Commission. They are strictly state roads, whereas "state aid" roads are now designated as "permanent" highways.

State Road Work in Washington

(Continued from page 150.)

Highway at Vancouver easterly and northeasterly to a connection with the Inland Empire Highway in the Yakima Valley, a total length of 162 mi. Affording as it does the only possibility for an "all-year" road route from western to eastern Washington, avoiding the snow blockades which close all the trans-Cascade Mountain road routes to the northward for several months every winter, this road will undoubtedly be made a "primary highway" by official designation. In scenic grandeur its completion will duplicate the renowned Columbia River Highway on the Oregon side of the gorge, and the two roads will take rank as America's greatest tourist attractions.

The State of Washington has thus far expended $218,071 in improving this road, and the three counties traversed—Clarke, Skamania and Klickitat—have added more than that amount in construction along permanent lines. The 1917-18 program assures $83,000 for completion of the road through the 6 mi. of most difficult construction in the heart of the Cascade Gorge. This constitutes the only absolute barrier in the continuity of the passable highway. More than $50,000 has already been spent upon these 6 mi., which will thus have an average cost of $25,000 per mi. when completed. With this Cascade barrier broken and traffic established over this route within two years, the continuing state and county program will assure its improvement throughout the entire length.

State Road No. 10—This road, the "river route" is 135 mi. long, and deserves recognition as a "primary" rather than "secondary" highway. It is passable throughout, although requiring improvement in several sections. The state has already expended $96,642 in permanent improvements, and the 1917-18 program provides $40,000 with $20,000 of federal aid in addition.

State Roads Nos. 11 and 12—These combine to make a northern trans-Cascade Mountain road up in the Skagit River on the west side and down the Methow on the east to its junction with the Columbia River. A fair road has been constructed by Skagit County from the Pacific Highway eastward about 50 mi. to the beginning of Road No. 11 at Marblemount. It is about 50 mi. from Marblemount to the Cascade summit (pass elevation about 6,000 ft.) A few miles have been constructed by the state at a cost of $35,595, to which $4,625 worth of work is being added in 1917. The state has expended $82,975 upon Road No. 12. With large additions by Okanogan County this expenditure has constructed more than 50 mi. of substantial road, which has made possible the development of a productive valley up to within 20 mi. of the Cascade summit. It will cost more than $500,000 to connect and complete State Roads 11 and 12 as a northern trans-Cascade highway. All of the uncompleted 60 mi. is within National Forests, and it is expected that with federal aid for half the cost, it will be constructed within the 10 years' program of the federal forest road provision.

Cascade Road—This is an alternative trans-Cascade route from Marblemount via the head of Lake Chelan to connect with Road No. 12 at Twisp. Its length would be about 75 mi. The state has expended about $30,000 in building rough roads and trails over the entire route, and has provided $4,625 for continued work in 1918.

State Road No. 15—This is a tributary road, 43 mi. long, up the north bank of the Lewis River from the Pacific Highway at Woodland. Between 1905 and 1912 the state expended $14,819 upon it, and it is now practically turned over to Cowlitz County as a main county road upon which additional improvements are being made by the county.

State Road No. 16—This is a road about 20 mi. long in southeastern Washington, running over the Blue Mountains between Garfield and Asotin Counties. It received $24,959 improvement from state funds about 10 years ago.

State Road No. 19—This road is an important route down the north bank of the lower Columbia River, from the Pacific Highway at Kelso, 76 mi. westerly to a connection with the National Park Highway. No state work has yet been done upon this route, but short sections have been improved by the counties crossed. Its completion, at a cost of at least $250,000, will be part of the four years' state program following 1918.

State Road No. 20—This is a connecting link, 32 mi. long, between the National Park Highway at Raymond and the Olympic Highway at Aberdeen. There has been no state appropriation but the route has been partially improved by the two counties crossed.

State Road No. 21—This is an important spur from the Olympic Highway at the bend of Hood Canal, northeasterly along the south shore of the upper "elbow" of Hood Canal and across the low divide to the head of Port Orchard and the Puget Sound Navy Yard vicinity. Affording as it does, the only land route of access to the Navy Yard, this road has strategic importance, and the 10-mile section from Port Orchard to Hood Canal has been approved and is about to be contracted as a federal aid project, for which $82,218 is available from cooperative state and federal funds. An additional $5,141 of state funds and a substantial provision by Mason County will be applied to improving this road along the south shore of Hood Canal. The completion of this road will afford a short connection from Seattle to the Olympic Highway circuit, in connection with a 15-mi. ferry route across Puget Sound to Bremerton.

State Road No. 22.—This is an 85-mi. connection between the Sunset Highway at Davenport and the Inland Empire Highway at Meyers Falls. A poor road now covers this entire route. The northerly 6 mi. will receive permanent improvement in 1917-18 from a cooperative state, county and federal aid fund of $40,000.

State Road No. 23.—This follows the Great Northern Railway northeasterly from Spokane 45 mi. to the Washington-Idaho boundary at Newport. It was constructed with a state expenditure of $104,016 in 1915-16 and is being completed with gravel surfacing in 1917. For this and other improvements on the 1918 program there is a state appropriation of $40,000.

The seventeen "secondary state highways" have a total length of 1,250 mi., thus making the state system include about 3,350 mi. of "primary" and "secondary" routes.

Upon them the State of Washington directly expended nearly $5,000,000 prior to 1917, and has provided almost $2,000,000 for the 1917-18 program. To this will be added $700,000 of federal aid under the post road and forest provisions of the federal aid road act. The county permanent improvements on state routes under state supervision have more than equalled the direct state expenditures, and will continue in that proportion to the completion of the program.

The state work is under the direction of the State Highway Board, which is made up of the following: Governor Ernest Lister, Chairman of the Board; State Auditor C. W. Clausen, State Treasurer W. W. Sherman, Public Service Commissioner E. F. Blaine; State Highway Commissioner James Allen, Secretary of the Board.

The three first named are elective state officers, and, as such, members of the State Highway Board, ex-officio. The two last named are appointed by the governor for four-year terms.

The State Highway Commissioner is the executive officer of the board, and has direct supervision over the State Highway Department. The present official, James Allen, has been connected with the department at various times since its establishment in 1905. He became Chief Engineer in 1913, and was appointed State Highway Commissioner in March, 1916, thus being responsibly concerned with the progress of the Washington highway program throughout its great period of development.

District Road Supervisors Appointed in West Virginia

The appointment of road supervisors for the various districts of West Virginia has been completed by the State Highway Commissioner. The supervisors named and the counties which they represent are as follows:

C. E. Grafton, for the counties of Hancock and Brooke; M. A. McCloskey, Jr., for Ohio; I. R. Wilson, for Marshall, Wetzel, Tyler and Doddridge; W. S. Downs, for Monongalia, Marion, Harrison, Taylor and Preston; Cleo Swecker, for Barbour, Lewis, Upshur and Randolph; E. St. C. Smith, for Tucker, Pendleton, Grant, Hardy, Mineral and Hampshire; E. L. Miller, for Morgan, Berkeley and Jefferson; George H. Hill, for Gilmer, Braxton, Webster, Clay and Nicholas; T. F. Maloy, for Pocahontas, Greenbrier, Monroe, Summers and the northern part of Fayette; J. K. McGrath, for Raleigh, Wyoming, Mercer and the southern part of Fayette; Blake Taylor, for McDowell, Mingo, Logan, Wayne and Lincoln; William Stephenson, for Cabell, Mason and Jackson; P. J. Walsh, for Putnam, Kanawha and Boone; W. J. Alexander, for Roane, Wirt, Wood, Ritchie, Pleasants and Calhoun.

Burdette Woodyard, Division Engineer of the State Highway Department, Parkersburg, has been appointed State Inspector of Roads.

Civil Service Examinations in New Jersey

Examinations for road inspectors will be held by the Civil Service Commission at the State House in Trenton, and at Newark, N. J., on Thursday and Friday, September 27 and 28. The State Highway Department needs inspectors in Grades A and B. The former position pays from $100 to $125 a month, and the latter from $75 to $100 a month. Complete information may be obtained from the Civil Service Commission.

Maj. H. L. Bowlby Appointed a Senior Highway Engineer

Major Henry L. Bowlby, formerly State Highway Engineer of Oregon, has been appointed Senior Highway Engineer in the Office of Public Roads and Rural Engineering, U. S. Department of Agriculture.

Major Bowlby has been engaged in private practice as consulting highway engineer in Portland, Ore., for the past two years. He served as State Highway Commissioner of Washington from 1909 to 1911 and as State Highway Engineer of Oregon from 1913 to 1915. Previous to his service in the Washington State Highway Department he was an instructor of civil engineering at the University of Washington. Major Bowlby is a member of the Engineer Division of the Officers' Reserve Corps.

Major Bowlby's headquarters will be at the District Engineer's office at Denver, Colo.

Resurfacing Highways in Harris County, Texas

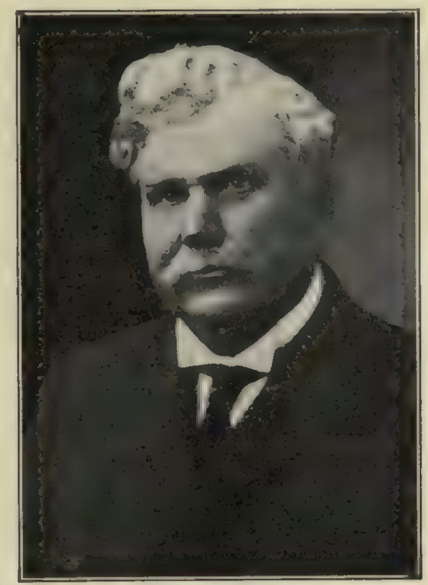
Looking toward the establishment of a permanent highway system in Harris County, Texas, the immediate construction of several miles of concrete road in addition to the resurfacing of 236 mi. of main highways of the county will be accomplished with the proceeds of bond issues amounting to $1,100,000.

One hundred thousand dollars will be devoted to concrete construction but not in one single stretch of road. It is thought desirable to divide the concrete mileage between precincts 1, 2, 3 and 4, and pave the Harrisburg Boulevard from the end of construction toward South Houston, the Houston-Crosby Road from the concrete bridge at Crosby south, the Humble Road, from Humble to Moonshine Hill, and the Washington County Road from the city limits of Houston to Camp Logan.

It is proposed to resurface the following roads: Laporte Road, from the end of Harrisburg Boulevard to Main St., Laporte, from Webster to Clear Lake Inn, and from Webster to the County line on the Galveston Road; the Houston-Crosby Road, from the city limits of Houston to Cedar Bayou turn; the East Montgomery Road from city limits to the county line; the Washington County Road from the end of the present pavement to the county line; and the West Montgomery Road from the Trinity & Brazos Valley Railroad crossing, northwest for a distance of about 5 mi.

The Washington State Good Roads Association and Its Coming Convention

The Washington State Good Roads Association, which will hold its eighteenth annual convention at Bellingham on Thursday and Friday of next week, September 27 and 28, was organized at Seattle in 1900. Its membership has included, and now includes, men of national and even international, reputation in the road improvement field, as well as many prominent citizens of the state. Its constant efforts for road improvement have brought it recognition as one of the leading local road associations in the country.


SAMUEL L. HILL,
Honorary Life President.

ROBERT L. SPARGER,
President.

FRANK W. GUILBERT,
Chairman, Executive Committee.

Officers of the Washington State Good Roads Association.

EDWARD MEATH,
Treasurer.

CLANCEY M. LEWIS,
Secretary.

The organization's activities have been directed to the accomplishment of three general purposes—the creation of public sentiment favoring the development of the highways of the state; the enactment of laws and the appropriating of funds for highway construction, and the bringing about of a recognition of the very great importance of adequate maintenance.

In the beginning the association's energies were bent to the accomplishment of the first of these objects—arousing public interest in road betterment and crystallizing sentiment for the development of Washington highways. As the association's labors bore fruit there naturally arose the necessity for turning its attention to the shaping of legislation to put into effect the ideas instilled into the public mind. Since the association had come to be recognized as the leader of public opinion and the medium for the expression of the popular will, the legislators turned to it for suggestions.

While Washington was still a territory and later during its early years of statehood, sporadic efforts had been made to better road conditions in the state. The association was largely instrumental in coordinating the efforts of various interests and shaping the legislation creating the first state highway department, established in 1905. The association has continued its activities in the shaping of the Washington road laws and has greatly influenced the successive legislative steps enlarging the state's powers, extending aid to the counties and providing funds for carrying out the road building program. Among the policies it has successfully advocated are the creation of a trunk line system, the utilization of convict labor and many other matters that are now included in the road building policies of the state.

One of the questions upon which the association took a decided stand was the issuing of bonds. When the primary and secondary highway systems of the state were established in 1913, there was a strong current of opinion in favor of bonding the state. The association took the position that the "pay as you go" policy was the better method of financing, and succeeded in securing the adoption of that plan.

With the improvement of the roads of the state, the growing demand for betterments, and increasing traffic, the matter of maintenance inevitably came to the front. Appreciating the necessity of the systematic and continuous upkeep of roads once improved, the association took up the matter of maintenance and is urging its importance. The prominence given that subject on the program of the coming convention evidences the earnestness with which the organization is working.

The constitution of the Washington State Good Roads Association, in its present form, was adopted at Walla Walla in December, 1910, and has proven satisfactory during the past seven years. The text follows:

I. Name: The name of this association shall be the "Washington State Good Roads Association."

II. Object: The association is created and established for the purpose of promoting and fostering the construction and maintenance of good roads throughout the state of Washington.

III. Officers: Its officers shall consist of a president, five vice-presidents, a treasurer and an executive committee of eighteen members, all of whom shall be elected annually at the regular annual meeting of the association, and all of whom shall serve without pay, and a secretary who shall be appointed by the president and shall be under his supervision, and who may be allowed such compensation as the executive committee may deem proper.

IV. Time of Meeting: A convention shall be held annually at the call of the president, and at such place as may be agreed upon by the preceding convention.

V. Membership: The voting membership of this association shall consist of the following: (a) The governor of the State of Washington. (b) Members of the State Highway Commission and president of state university and state college. (c) Every county commissioner in the State of Washington. (d) Every county engineer in the State of Washington. (e) Every good road association, every commercial organization, every farmers' union, every grange, every automobile association, and every other like and kindred organization' having for its object the up-building of the interests of the people of Washington; also the engineering department of any college in the state shall be entitled to one delegate at large and one additional delegate for every fifty members or major fraction thereof. (f) All officers of this association. (g) Any citizen of this state may become a member of this association by paying the annual fee, but such membership gives only the right of the floor, but not of vote.

VI. Standing Committees: The president of this association shall, annually, appoint the following standing committees:

(a) A committee of five for legislation, which shall report and recommend to the association such subjects for legislation as it may deem most needful to meet the purposes of this organization.

(b) A committee of three on general arrangements, whose duty it shall be, after the convention shall have selected the place of its meeting, to make such arrangements as they deem necessary for the proper and suitable meeting of the association and the accommodation of its members, and the seating of its delegates in a body to themselves.

(c) A committee of three on finance, whose duty it shall be to recommend from time to time such measures as in its judgment shall be calculated to serve the financial interests of this association, and to audit and report from time to time upon the accounts of any officer of this association charged with handling and disbursing of funds, and who shall also require from such officers a surety bond at the expense of this association.

The chairman shall appoint such special committees from time to time as may be deemed necessary to best promote the interests of the association.

VII. Dues: The annual membership fee shall be one dollar for each member of this association, which shall be paid before he is entitled to a seat in the convention.

VIII. Amendments: The by-laws may be amended at any regular meeting of the association by majority vote.

IX. Order of Business: The committee on arrangements, in connection with the president, secretary and treasurer of this association, shall, prior to the regular convention, prepare a program and order of business for the coming convention.

The present officers of the association are as follows:

Honorary Life President, Samuel Hill, Seattle.

President, Robert L. Sparger, Seattle.

Vice Presidents: Arthur D. Jones, Spokane; Frank Terrace, Orillia; Oliver Hall, Whitman; E. M. Gillette, Wenatchee; J. A. Fontaine, Dayton.

Treasurer, Edward Meath, Tacoma.

Secretary, Clancey M. Lewis, Seattle.

Executive Committee (representing counties): Chairman, Frank W. Guilbert, Spokane; John P. Hartman, King; W. J. Sutton, Spokane; E. C. Burlingame, Walla Walla; Hans Mumm, Jr., Snohomosh; N. B. Coffman, Lewis; Lee Monohan, King; Torger Peterson, Pierce; J. J. Donovan, Whatcom; Henry Perry, King; James Leslie, Yakima; J. E. Calder, Grays Harbor; Ralph Comegys, Whitman; Fred L. Wolf, Pend Oreille; J. C. Hubbell, Kittitas; J. G. Kulzer, Stevens; D. C. Thiemens, Grant; W. H. Reed, Pierce.

The program of the eighteenth annual convention at Bellingham follows:

THURSDAY, SEPTEMBER 27, 1917

Registration; 9:00 a. m.
Bellingham Chamber of Commerce

First Session; 11:00 a. m.

Addresses of Welcome:
A. M. Muir, Mayor of Bellingham; in behalf of the City.
J. B. McMillan, Chairman, Whatcom County Commissioners; in behalf of the County.

Response:
Arthur B. Jones, Vice President, Washington State Good Roads Association.

Annual Reports of Officers:
Robert L. Sparger, President
Frank W. Guilbert, Chairman, Executive Committee

Delegation Meetings; 12:00 m.
Luncheon; 12:30 p. m.

Second Session; 1:30 p. m.

The Old Guard: A Mustering in of the Veterans of the Washington State Good Roads Association.

Announcement of Appointment of Committees on Credentials, Finance, Nominations, Resolutions.

Automobile Trip; 2:30 p. m.
Inspection of County Roads and the Waterfront
Clam Bake; 5:00 p. m.
Larabee State Park

Third Session; 8:00 p. m.

"State Highway Department Night"

Discussion; Led by James Allen, State Highway Commissioner, and others.

FRIDAY, SEPT. 28, 1917

Fourth Session; 9:00 a. m.

Topic: Our National and State Highways and Their Uses:

(1) Relation to Tourist and Automobile Travel:
Discussion; led by I. M. Howell, Secretary of State, and others

(2) Relation to Agricultural Development:
Discussion; led by Frank Terrace, Orillia, and others.

(3) Relation to Commercial and Industrial Progress:
Discussion; led by B. L. Farnsworth, Davenport, and others.

(4) Relation to Government Achievement:
Discussion; led by Dr. L. I. Hewes, District Engineer, U. S. Office of Public Roads and Rural Engineering, and others.

Luncheon; 12:00 m.

Fifth Session; 2:00 p. m.

Topic: Maintenance:
  General Discussions; led by R. H. Thompson, Seattle, and others
Committee Reports:
  Finance Committee
  Resolutions Committee
  Nominating Committee
Election of Officers
Introduction of New President
Selection of 1918 Convention City.

Sixth Session; 8:00 p. m.

Topic: Military Roads and Their Relation to National Highway Systems:
  General Discussion; led by Samuel Hill, Seattle, and others.

Call for Bids for Pennsylvania Highway Work

On Oct. 9 and 16 the State Highway Commissioner of Pennsylvania will open bids for the construction of 27.34 mi. of improved highways in thirteen different counties of the state. Bids asked for Oct. 9 are for work in Cambria, Washington, Allegheny, Lehigh, Butler, Montgomery, Venango, Lackawanna and Westmoreland Counties; Oct. 16 for work in Armstrong, Somerset, Center and Greene Counties.

The projects proposed for Lackawanna, Westmoreland and Greene Counties are new, but all of the others have been advertised previously, the bids that were received having been rejected because of excessive prices. The proposed work is as follows:

Cambria County: Mundy's Corner Road, 20,948 ft. long, 16 ft. wide, vitrified block; for the convenience of bidders, divided into two sections; first, located in East Taylor Township, 9,878 ft.; second, in Jackson and East Taylor Townships, 11,070 ft.

Washington and Allegheny Counties: Again bids are asked for improvement of the Pittsburgh Pike between Bridgeville and Greensburg, on State Highways Route 108, 36,170 ft. long, 16 ft. wide, reinforced concrete and vitrified block; 19,318 ft. located in Cecil and North Strabane Townships, Washington County; 16,852 ft. in South Fayette Township, Allegheny County.

Washington County, East Bethlehem Township: Road connecting at Centerville Borough and extending to Fredericktown, along the Monongahela River, 5,900 ft.; reinforced concrete and vitrified block; State Aid Application 738, State Highway Route 268.

Lehigh County, Hanover Township, Bethlehem to Allentown, State Highway Route 159; 11,857 ft. long, 16 and 20 ft. wide, reinforced concrete.

Butler County, Clinton Township: Saxonburg south to Allegheny County line, State Aid Application No. 417; 5,800 ft. long, 16 ft. wide, vitrified block.

Montgomery County, Abington, Upper Moreland and Upper Dublin Townships, State Aid Application No. 648; 6,537 ft. long, 16 ft. wide, reinforced concrete.

Venango County, Cornplanter Township, Oil City to Rouseville, State Aid Application No. 681; 7,857 ft. long, 16 ft. wide, vitrified block.

Lackawanna County, Moosic and Old Forge Boroughs: State Aid Application Nos. 442 and 487; 6,562 ft. long, 16 ft. wide, reinforced concrete.

Westmoreland County, East Huntingdon Township: Scottdale towards Greensburg, State Aid Application No. 324; 2,540 ft. long, 16 ft. wide, vitrified block.

Armstrong County, Manor Township, Ford City-Kittanning Road, State Aid Application No. 397; 13,007 ft. long, 16 ft. wide, vitrified block.

Somerset County, Somerset Township: Part of project to connect the Lincoln Highway with the National Pike; State Aid Application No. 739; 6,675 ft. long, 16 ft. wide, vitrified block.

Center County, Bellefonte Borough: 2,454 ft. long, 16 and 20 ft. wide, vitrified block.

Greene County, Morgan and Franklin Townships: State Highway Route 268 from Waynesburg to Rice's Landing, on the Monongahela River; 18,083 ft. long, 16 ft. wide, vitrified block.

W. W. Crosby Appointed a Lieutenant-Colonel

Walter Wilson Crosby, for several years a major in the Maryland National Guard in the adjutant-general and inspector-general's departments, has been made a lieutenant-colonel and transferred to the 104th Regiment of Engineers.

Col. Crosby, who has been Treasurer of the American Road Builders' Association for a number of years and who served as Chief Engineer of the Maryland State Roads Commission for several years, was inspector-general of the National Guard of Maryland from the mobilization of state troops last year until he was appointed assistant to the chief of staff of the 15th Division, U. S. A., and assigned to duty at Laredo, Texas. Col. Crosby's new regiment, the 104th Engineers, forms a part of the 29th National Guard division, which is now in training at Anniston, Ala.

State Road Construction in Missouri

Pending the receipt of the approval of the secretary of agriculture of federal aid projects submitted by the Missouri State Highway Board arrangements were completed a short time since for the use of state road funds in order that actual construction of the highways may not be delayed.

The building of a state road in Taney County, between Branson and the Arkansas line, is now under way, under the above arrangement, while surveys have been completed and the work is being started on a state road project in Montgomery County. The state road which will connect Columbia and Jefferson City is also being surveyed.

The work of checking up the 11,300 mi. of inter-county seat highways, apportioning the $200,000 road drag fund, and examining the plans and specifications submitted by 114 counties to secure their share of the 1917 appropriation for the permanent improvement of county roads, has been practically finished by the State Highway Department. All counties have been asked to prepare and submit surveys of officially designated state roads as soon as possible in order to avoid delay in construction. The department takes the position that federal funds can be used to best advantage on projects involving a large expenditure, as this will provide for inspection on the 3% basis allowed by the federal law; and that state aid, without federal funds, can be better applied on smaller projects, thus eliminating the necessity of elaborate and expensive surveys, and enabling counties to proceed with the construction of state roads under the direct supervision of the state highway engineer without delay.

The Monument Farmers' and Homemakers' Club, of Monument, Colo., in protesting against the opening of a new road to Eastonville, has presented a resolution to the county commissioners requesting that the funds be used for the improvement of the main existing highway between the two points, which, it is stated would further the agricultural interests of the community.

The Business Men's Club of Whitesburg, Ky., has organized to promote the construction of a through road from Lexington, Ky., to Norton, Va. The highway will traverse seven of the richest counties of eastern Kentucky, viz., Fayette, Clark, Estill, Lee, Breathitt, Perry and Letcher and will connect Lexington, Irvine, Bettyville, Jackson, Hazard, Whitesburg and Jenkins, Ky., with Wise and Norton, Va., covering a distance of 225 mi. The project is receiving the approval of residents along the proposed route.

MEETINGS

Calendar of Coming Meetings

Sept. 24-29.—League of California Municipalities.—Annual convention, Santa Rosa, Cal. Secretary, Wm. J. Locke, Pacific Building, San Francisco, Cal.

Sept. 27-28.—Montana State Good Roads and Automobile Association—Annual convention, Helena, Mont. Secretary-treasurer, Martin Martin, Anaconda, Mont.

Sept. 27-29.—Washington State Good Roads Association.—Annual convention, Bellingham, Wash. President, Robert L. Sprager, Artic Club. Seattle, Wash.

Oct. 9-12.—League of Kansas Municipalities.—Annual convention, Wichita, Kan. Secretary C. H. Talbot, University of Kansas, Lawrence, Kan.

Oct. 16-19.—Southern Appalachian Good Roads Association.—Ninth annual convention, Nashville, Tenn. President, Henry Roberts, Bristol, Va.

Oct. 17-18.—League of Minnesota Municipalities.—Fifth annual convention, St. Cloud, Minn. Secretary-Treasurer, Richard R. Price, University of Minnesota, Minneapolis.

Oct. 29-30.—Oklahoma Society of Engineers.—Annual convention, Oklahoma City, Okla. Secretary-Treasurer, H. V. Hinckley, Oklahoma City, Okla.

Nov. 19-24.—City Managers' Association.—Annual meeting, Detroit, Mich. Secretary, W. L. Miller, City Manager, St. Augustine, Fla.

Nov. 21-24.—National Municipal League.—Twenty-third annual meeting, Hotel Statler, Detroit, Mich. Secretary, Clinton R. Woodruff, 703 North American Building, Philadelphia, Pa.

Dec. 4-6.—American Association of State Highway Officials.—Annual meeting, Hotel Jefferson, Richmond, Va. Acting Secretary, H. M. Berry, Chapel Hill, N. C.

Jan. 15-17, 1918.—Virginia Good Roads Association.—Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

Washington State Good Roads Association

As noted in preceding issues, the Washington State Good Roads Association will meet in annual convention at Bellingham, Wash., Sept. 27 to 29, inclusive. The complete program of the meeting is printed on other pages of this issue.

Washington State Association of County Commissioners

A resolution calling for the acquisition and control by the state of a cement plant was adopted by the State Association of County Commissioners at the closing session of its annual convention at Spokane on Sept. 8, following the report of Charles R. Howland, Chairman of the Resolutions Committee. The report also proposed that a committee of eight be appointed to codify and standardize the highway laws of the state, two members to be named by the county commissioners' association, two by the county engineers' association, two by the Washington State Good Roads Association, one by the state highway commissioner, and one by the attorney general.

The county commissioners will meet with the county engineers at Seattle next year.

The following were elected for the ensuing year: T. Ives Dodge, of Olympia, President; A. C. Moore, of Walla Walla, Vice President; W. Scott Coe, of White Salmon, Secretary-Treasurer.

The main features of the program of the convention and a report of the meeting were printed in the issues of Sept. 8 and 15, respectively.

Washington State Association of County Engineers

The State Association of County Engineers, which adjourned at Spokane, Wash., on Sept. 8, passed a resolution requesting the Legislature to make the office of county engineer appointive under the board of county commissioners; also to prohibit all loads exceeding 20,000 lb. on the public highways.

G. G. Hawley, County Engineer of Lincoln County, was elected President; R. F. Foster, of Douglas County, First Vice President; D. H. White, of Pierce County, Second Vice President; and Charles A. Lindbery, of Whatcom County, Secretary-Treasurer.

A previous report of the convention appeared in "Good Roads" for Sept. 15. The program of the sessions held in conjunction with the annual meeting of the State Association of County Commissioners was printed in the issue of Sept. 8.

Road Officials at Columbus, Ohio

At a good roads meeting called by the State Highway Advisory Board and the State Highway Commissioner, recently held at Columbus, Ohio, a vigorous road building program was advocated. The meeting was composed of county surveyors, county commissioners, county auditors and county prosecuting attorneys. The following resolutions were presented by Secretary W. A. Alsdorf of the Ohio Good Roads Federation and were adopted unanimously.

WHEREAS, no greater national necessity exists than the need of improved transportation facilities, in order to get foodstuffs to market, to relieve congested railroad terminals, and to get manufactured products from the factories to the jobber and consumer, and to help Uncle Sam's war program; and

WHEREAS, no more effective blow can be struck at the high cost of living than by putting the farmers and market gardeners of the state in close touch with the great centers of population through the construction of a complete system of modern roads available for use in all seasons; and

WHEREAS, Ohio has a fixed road program with revenues established, and work under way, which in the recent words of Governor James M. Cox, "must go forward to completion," and counties and townships are cooperating with the state and nation in highway improvement, now therefore,

BE IT RESOLVED: By the officials of the State Highway Department and the county commissioners, county surveyors and county auditors of the State of Ohio, that, for these reasons and to meet the exigencies of war, we demand a harmonious cooperation of road officials in the performance of their duties, the abandonment of makeshift policies, and the adoption of a vigorous, go-ahead road building program in the State of Ohio; and

BE IT FURTHER RESOLVED: That we pledge our united support to the State Highway Commissioner and the State Highway Advisory Board in the collection and compilation of all data necessary to secure through the action of National Council of Defense and other agencies of the federal and state governments an adequate supply of cars for the shipment of road building materials; and also in the collection of such information as may be necessary in the securing of labor and the marketing of securities; and

BE IT FURTHER RESOLVED: That copies of these resolutions be forwarded to the National Council of Defense, the Secretary of Agriculture, the Interstate Commerce Commission, the Ohio Public Utilities Commission, and to Ohio senators and representatives in the national Congress, and that copies of the same be furnished to the press of the state.

Southern Appalachian Good Roads Association

Preparations are being made for the ninth annual convention of the Southern Appalachian Good Roads Association at Nashville, Tenn., Oct. 16 to 19, inclusive. The program will embrace the subjects of federal and state aid, national military highways, maintenance, state maintained road systems, convict labor, road financing, roads needed, and closer cooperation between the states in highway plans and standardization of road work.

The preliminary announcement of speakers contains the following: Gov. Tom C. Rye, of Tennessee; A. D. Williams, Chairman, West Virginia State Highway Commission; C. B. Scott, Assistant State Highway Commissioner of Virginia; W. S. Keller, State Highway Engineer, of Alabama; Rodman Wiley, Commissioner of Public Roads of Kentucky; John Craft, President, Alabama Good Roads Association; John E. Edgerton, President, Tennessee Manufacturers' Association; Sen. J. Parks Worley, of Tennessee; Sam R. Sells, Congressman, of Tennessee; X. A. Kramer, State Highway Engineer of Mississippi; A. M. Nelson, State Highway Engineer of Tennessee; Arthur Crownover, Chairman, and J. J. Murray, Secretary, Tennessee Highway Commission; E. W. James, of the U. S. Office of Public Roads and Rural Engineering; and Chief Engineer Norcross of the Forest Service, Washington, D. C.

Inspection tours will be run to the convention over the interstate highways centering at Nashville, and street meetings will be held en route by motor parties in the cause of state road systems maintained by the southern Appalachian states.

Rural Letter Carriers' Association of Madison County, Nebraska

At the fall convention of the Rural Letter Carriers' Association of Madison County, Nebraska, held at Newman Grove Sept. 3, which was attended by county road and other officials as well as a number of letter carriers from other counties, the question of bettering road conditions was discussed, and the following resolution was adopted:

Resolved, That we, the rural carriers of Madison, Stanton, Platte and Boone Counties, with the approval of the county commissioners, petition the voters of the aforesaid counties to call an election authorizing the commissioners to make a 10-mill levy for the purpose of building dirt roads.

Chamber of Commerce of the United States of America

The "War Convention of American Business" was held under the auspices of the Chamber of Commerce of the United States at the Garden Pier, Atlantic City, N. J., from Monday to Friday, inclusive.

Addresses by government officials and prominent business men and discussions on a variety of topics bearing upon the relation of business to the war occupied the time of those in attendance on Tuesday, Wednesday and Thursday. Monday was devoted to a meeting of the National Council of the Chamber of Commerce of the United States and the one session Friday to the report of the resolutions committee. To facilitate the proceedings, group meetings were held for the discussion of various topics on Wednesday afternoon and Thursday forenoon.

The matter of roads was introduced at the general session Wednesday forenoon when the convention took up the topic: "How American business can help promote the development of transportation on land and sea as a primary factor in winning the war." The meeting was addressed by A. P. Sandles, of Columbus, Ohio, Secretary of the Ohio Macadam Association. At the close of his remarks, Mr. Sandles offered the following resolution, which was adopted by the meeting and referred to the committee on resolutions:

> WHEREAS, there are now several federal agencies vested with authority to further the production and conservation of foodstuffs and other commodities; and
>
> WHEREAS, it is essential to the nation's welfare to improve transportation facilities in order to get foodstuffs to market, to relieve railroad congestion and to move manufactured products from the factory to the consumer; and
>
> WHEREAS, the use of public highways for short haul traffic offers the best and quickest means of supplementing transportation by railroad and water; now therefore
>
> BE IT RESOLVED: That the improvement of public highways is important and essential as a war measure and should be urged in every passible way.

The resolution was introduced at the meeting of Group A on Wednesday afternoon by G. M. Williams, Sales Manager of the Garford Motor Truck Co., of Lima, Ohio. This group meeting, held to discuss the "function of the commercial organizations in war," also unanimously adopted the resolution.

PERSONAL NOTES

J. W. Greer has been appointed City Manager of Bryan, Texas.

Ernest P. Goodrich, formerly consulting engineer of the city of New York, and Geo. B. Post & Sons, architects, of New York City, have become associated in the business of engineering and architecture.

George L. Christian has been appointed Deputy City Engineer of Yonkers, N. Y. He was formerly connected with the Department of Public Works of Manhattan Borough, New York City, as an assistant engineer.

W. W. Whipkey, a graduate of the A. & M. College of Texas, is now City Engineer of Paris, Texas. Former City Engineer Helland enlisted a short time ago in the Engineers' Reserve Corps, as noted in a previous issue.

Dr. Josph Hyde Pratt, Secretary of the North Carolina State Highway Commission, and an officer of several highway organizations, is now in active military service as Major of the 105th Engineer Regiment, stationed at Camp Sevier, Greenville, S. C.

Miss Esther Jack, the first woman graduate of the engineering department of the University of North Dakota, has been appointed City Engineer of Williston, N. D., taking the place of Capt. E. R. Evans, who is now in the service of the Government.

Allan R. Scott, County Engineer of Spokane County, Washington, has been appointed head of the Highway Department of the county by the Board of County Commissioners, for the purpose of centralizing authority and responsibility for road work.

Henry Welles Durham, consulting engineer, of New York City, formerly chief of the Bureau of Highways of the Borough of Manhattan, and later County Engineer of Bergen County, New Jersey, hasbeen called to service in the Engineer Officers' Reserve Corps.

E. E. Clancy, Secretary of the Eureka Paving Co., of Houston, Texas, severed his connection with that company on September 1, and has become associated with the Kinney Method Co., of Houston.

PUBLICATIONS

STATE OF ILLINOIS, DEPARTMENT OF PUBLIC WORKS AND BUILDINGS, DIVISION OF HIGHWAYS, SPRINGFIELD, ILL.: General Specifications for Bridge Work, Edition of August, 1917. Paper, 8¼x10¾ in., 80 pp. and covers.

This publication contains specifications that will be used on all bridge work in Illinois after Sept. 15, 1917, in relation to structures which are expected to carry highway traffic only. Preference is given to concrete and steel bridges under the conditions described. All changes from the edition printed in October, 1916, are printed in italics.

CITY OF MELROSE, MASSACHUSETTS, PUBLIC WORKS DEPARTMENT. Seventeenth annual report for the fiscal year ending Dec. 31, 1917, by George O. W. Servis, Engineer and Superintendent of Public Works. Paper, 6x9 in., 35 pp. and covers.

The greater portion of this report consists of tabular statements relating to the various divisions of the Department of Public Works of the City of Melrose, which has general care of all public highways, the construction of new sidewalks, street lighting, street sprinkling, street cleaning, collection of ashes, street signs and house numbering, and all work connected with the sewer, surface drainage and water systems, and various other features of the municipal administration. Under the Highway Division, the operations of the year are set forth and general progress noted.

HOW MUCH DOES YOUR TEAM PULL?—A POPULARIZED REPORT OF TRACTIVE RESISTANCE ON VARIOUS ROAD SURFACES. Issued by the Good Roads Bureau of the California State Automobile Association, San Francisco, Cal. By Prof. J. B. Davidson, Division of Agricultural Engineering of the University of California. Paper, 6x9 in., 16 pp. and covers; illustrated.

This booklet contains the results of road tests made by Prof. J. B. Davidson and his assistant, L. J. Fletcher, with Austin B. Fletcher, Engineer of the California Highway Commission; C. H. Sweetser, District Engineer of the U. S. Office of Public Roads and Rural Engineering, and W. H. Lynch, Senior Highway Engineer of that office. The tests were made on earth, gravel and macadam roads under varying conditions, and on concrete with different surfacings, which are shown in half-tone illustrations. A table of results gives the tractive resistance for each type per ton. There are two pages of charts, showing sample records made in the tests.

EQUIPMENT—TRADE—MATERIALS

Employees of the Asbestos Protected Metal Company in the Army

Since the entrance of the United States into the war, several of the employees of the Asbestos Protected Metal Company of Pittsburgh, Pa., have enlisted in various branches of the service. The names of those who have so far answered the call to the colors are as follows:

Stuart S. Caves, formerly in the company's engineering department, Officers' Reserve at Ft. Niagara; F. C. Easterby, formerly district representative at St. Louis, constructing quartermaster at Ft. Riley, Kansas; W. C. Fanning, formerly in the engineering department, Officers' Reserve at Ft. Niagara; Wm. H. Hale, formerly district representative at Minneapolis, Minn., Officers' Reserve; E. G. Irwin, formerly district representative at Cincinnati, Ohio, National Guard; J. R. Nichols, formerly district representative at Atlanta, Ga., Field Artillery; Walter A. Slinglaff, formerly in the skylight department, Pittsburgh Regiment of Engineers, now in France; John B. Williamson, formerly in the erection department, first lieutenant of engineers; P. J. Young, formerly chief engineer, first lieutenant of engineers, now in France; T. R. Galey, formerly district representative at Dallas, Texas, Officers' Reserve, Leon Springs, Texas.

H. E. Hilts Appointed General Manager of the Portland Cement Association

H. E. Hilts, formerly district engineer of the Portland Cement Association at San Francisco, has been elected by the board of directors of that body to succeed the late J. P. Beck as general manager.

Mr. Hilts received his engineering education at the University of Pennsylvania. His first work was as a rodman of the Mexican International Railroad, after which he was employed by the Philadelphia and Western Railroad. He served as an instructor in the engineering department of the University of Pennsylvania for two years, and was then employed by the New York Central Railroad. He left that company in 1913 and became road engineer with the Portland Cement Association in the territory comprising the New England and northeastern states. He was made district engineer in San Francisco in 1915.

Mr. Hilts is an associate member of the American Society of Civil Engineers, a member of the American Society for Testing Materials, an associate member of the American Railway Engineering Association and a member of the American Concrete Institute.

The Foote Concrete Machinery Co., of Chicago, Ill., has moved its office from 108 South La Salle St. to 1324 South Michigan Ave., in that city.

NEWS NOTES

A Recent Attempt by the Maryland State Roads Commission to set to work an army of idlers registered under the Compulsory Work Act resulted in an open discussion of constitutional rights.

The Making of Road Signs by Inmates of the Ohio Penitentiary is under consideration by the State Highway Department and the prison authorities. It is proposed to sell the signs to the counties at cost.

The Road Hearings of the New Jersey State Highway Commission will close with the meeting which is scheduled for Hackensack on Oct. 25, after which it is expected that the commission will decide upon the exact routes to comprise the highway system of the state.

Bond Issues Aggregating $1,826,100 for street and sewer improvement have been proposed in Cincinnati, Ohio, and will come before the people at the November election. A list of the proposed improvements has been submitted by City Engineer Frank S. Krug to the City Council.

"Alabama Project No. 1"—the first road in Alabama to be constructed under the federal aid road law—comprises 9 mi. of highway running from Union Springs toward Montgomery. It lies in Bullock County, which must pay half its total cost, which will be $22,000. It will connect with an improved road leading to Montgomery. Seven or eight months will be required for the completion of the highway, according to report.

The Railless Trolley Service in England is described as a pioneer service for thinly populated areas, prior to the installation of an ordinary trolley route, by A. E. Ingram, U. S. Consul at Bradford, who states that this form of traction has proved a success in that municipality. Five such routes, with a total mileage of 9½ mi., are operated in the city, with an important increase in car mileage, the average fare per mi. being $0.018. The cars have solid rubber motor truck tires, and are operated by overhead wire current. Each car has a seating capacity of 29 persons, the crew consisting of motorman and conductor. As yet no freight or parcel delivery system has been put into service on the trackless trolley lines, according to Mr. Ingram.

GOOD ROADS

A Weekly Journal of Road and Street Engineering and Contracting

Old Series, Vol. LII
New Series, Vol. XIV

NEW YORK, SEPTEMBER 29, 1917

Number
13

The Construction of National Pavement in New Jersey

There has recently been completed on Ridgewood Avenue, Glen Ridge, N. J., a section of about 16,000 sq. yd. of "National" pavement a bituminous surfacing differing materially from other types of bitumen bound pavements in common use. A similar pavement has also been laid during the past few weeks on East 18th Street, Paterson, N. J. These two pavements, with a section on Springfield Avenue, in Millburn, N. J., and a number of streets in the town of Belleville, N. J., are typical of the pavements of this type that have been laid in the East.

Briefly described, this pavement consists of a very intimate mixture of finely divided earthy materials and asphalt, laid hot and rolled. The first street pavement of this type was put down on Colborn Street, Iola, Kan., and was described in these columns about four and one-half years ago. ["New Bituminized Pavement at Iola, Kansas," "Good Roads," April 5, 1913, page 231.] About a year later several more blocks were put down in the same city, and since then it has been laid in a number of places in the Middle West. A detailed description of the later work at Iola and of the machine employed in the prepartion of the paving mixture was printed in 1914. ["An Earth and Asphalt Pavement," "Good Roads," March 7, 1914, page 169.]

On Ridgewood Avenue "National" pavement was used to resurface an old macadam road on a telford base. The old roadbed was scarified to a depth of 4 in. where this could be done without disturbing the telford, and brought up to within 2 in. of the finished grade, with 1½-in. stone and fine material to partially fill the voids. As the new pavement was laid 24 ft. wide and the old telford is only 16 ft. in width, the roadbed was widened 4 ft. on each side, the additional width being obtained by excavating and filling with a course of 2½-in. stone and screenings from 4 to 6 in. deep and a second course of 1½-in. stone and filler, about 2 in. in depth. The surfacing was mixed at a plant in Belleville, hauled about 5 mi. to the job by a fleet of motor trucks, and laid in two 1-in. courses. After laying each course was consolidated with a light tandem roller.

The portable asphalt plant used on this work was constructed by the F. D. Cummer & Sons Company of Cleveland, Ohio, under patents owned by the Cummer Company, and the patents of the Bituminized Road Company of Kansas City, Mo., which cover a special pulverizer in combination with the ordinary asphalt plant. It was set up at the foot of the bank from which the earthy material for the mixture was obtained. This material was a clayey soil,

RECENTLY COMPLETED NATIONAL PAVEMENT ON RIDGEWOOD AVENUE, GLEN RIDGE, N. J.

SPREADING AND ROLLING NATIONAL PAVEMENT ON E. 18TH ST., PATERSON, N. J.

MIXING PLANT FOR NATIONAL PAVEMENT SET UP AT BELLEVILLE, N. J., IN OPERATION.

distinctly red in color, known locally as "yellow clay." It was brought to the loading platform by a Fresno type scraper and dumped through an opening to the foot of a bucket elevator, by which it was conveyed to the pulverizer. It was pulverized, dried and mixed with the heated asphalt and discharged by gravity to the trucks. The completed mixture consisted of about 80% of clay and 20% of asphalt.

The work was done by the Franklin Contracting Company of New York, N. Y., working under license from the Bituminized Road Company of Kansas City, Mo., owner of the patents under which "National" pavement is laid. The prices were as follows: Excavation, 90 ct. per cu. yd.; scarifying, 11 ct. per sq. yd.; stone, all sizes, $2.48 per ton; top, laid, $1.62 per sq. yd.

The completed pavement is similar in appearance to sheet asphalt, but differs materially in character. It is soft enough so that a knife blade can readily be inserted, but it has not become rutted or wavy under the traffic it has had to carry, such marks as are made quickly "ironing out" under further traffic. It does not bleed or, as stated by the patentees, is "non-flowing," and varies little in hardness at different seasons. The mixture is black and makes a very dark pavement, though in the Ridgewood Avenue work a top dressing of limestone dust was used to give the finished pavement a light color.

The work recently finished at Paterson comprised the construction of 2,781 sq. yd. of "National" pavement on East 18th Street, from the N. Y. S. & W. R. R. to Governor St. The foundation consists of a 5-in. course of 2½-in. crushed stone, sand filled. The wearing surface was laid to a finished thickness of about 2¼ in. two courses of approximately equal depth. The contract was awarded to the Franklin Contracting Co. at the following prices: "National" pavement, $1.66 per sq. yd.; foundation $.60 per sq. yd.; grading $1.10 per cu. yd. The job was county work and was under the direction of County Engineer Garwood Ferguson of Passaic County.

The work done by the Town of Belleville comprises 26,500 sq. yd. contracted for in 1916 and 6,500 sq. yd. contracted for this year. The 1916 contract comprised 7,000 sq. yd. on Division Ave., 6,000 sq. yd. on Malone Ave., 6,000 sq. yd. on Tappan Ave., and 7,500 sq. yd. on Little St. On each street the "National" pavement, 2 in. in thickness, was laid in two 1-in. courses on a 4-in. cement concrete foundation. The work was done by the Franklin Contracting Co. at a contract price of $1.98 per sq. yd., exclusive of excavation, for Division and Malone Aves., and $1.99 per sq. yd., also exclusive of excavation, for Tappan Ave. and Little St. The contract price for excavation was 50 ct. per cu. yd. on all four jobs. Part of the work was done last year and part this year.

Division Ave. Malone Ave.

NATIONAL PAVEMENTS LAID IN BELLEVILLE, N. J., UNDER 1916 CONTRACTS.

This year's contract comprised the laying of 4,000 sq. yd. on High St. and 2,500 sq. yd. on Hornblower Ave. In both cases two 1-in. courses of surfacing were laid on a 4-in. concrete base The Franklin Contracting Co. did the work at a contract price of $2.64 per sq. yd., exclusive of excavation. The price for excavation was $1.00 per cu. yd.

The work was done under the direction of F. T. Shepard, Town Engineer of Belleville

While in the work described the clayey soil referred to has been used, other materials can be utilized equally well. In fact, one of the chief advantages claimed for "National" pavement is the possibility of utilizing local materials. The first patents, granted to M. A. Popkess and owned by the Bituminized Road Co., covered earthy materials substantially free from sand, stone or gravel. Recently, however, the Patent Office has granted additional letters patent covering a combination of this non-flowing earthy asphalt mixture known as "National Product" with a mineral aggregate filler of sand, gravel or crushed stone. The patents cover the product, the process and the machine used.

Planning County Highway Work*

BY L. I. HEWES†

During the past five years the duties of county engineers in an increasing number of states have become largely those of county highway engineers. It is pertinent for a gathering of this nature to inquire into these duties and responsibilities, and perhaps to examine the qualifications and rewards of the county engineer. The 3,000 counties in this country are themselves expending annually for roads nearly 72% of the grand total of three hundred million. (In 1915, of total expenditures in the United States of $282,000,000 local authorities spent about $202,000,000.) In the State of Washington 39 counties have expended for roads during the past ten years approximately $47,000,000, or an average of about $1,205,130 each.

It is evident therefore that the county engineer has a position of increasing importance. The responsibilites of this engineer or county highway engineer are actually much greater than the public realizes. If he is to continue as a self-respecting municipal officer he must be given greater freedom of action, for it is inevitable that when the present transition stage with its restrictions of local law is left behind us, it will be the county engineer who decides matters of technique regarding roads and it is for this matter of technique or actual construction and maintenance details that he must be equipped to meet his growing responsibility.

To that end it is well to examine the method by which county highway engineers come to office and by virtue of what previous training they assume responsibility.

For a long time our technical schools and colleges hesitated to emphasize highway engineering. There has been and still is a degree of uncertainty as to what position highway instruction should occupy. The net result so far seems to be a major elective during junior or senior year occupying usually not more than one semester or at most three hours per week for one year. This work has been supplemented, with considerable success, by short road schools at perhaps a score of our universities.

In the past, to a great extent, county highway engineers have necessarily been transplanted railroad engineers, former city engineers, or graduate civil engineers with little specialization. It takes but a year or two of actual road work, however, to convince the most skeptical that highway engineering has a distinct place among other branches of engineering, and that it deserves the place it is rapidly winning.

There are rapidly opening up in the 3,000 counties engineering positions that require high professional skill; the path of preparation leading to these positions is not entirely clear, and the duties of these positions remain to a large extent undefined.

It seems a fair question to submit as to whether it is not the duty of organizations of this nature to take under consideration in a serious manner the fundamental principles of their profession in an endeavor to create, as far as may, a distinct professional atmosphere so that there may be loyalty to the best ideas so far produced, and a firm front to resist the constant pressure for unprofessional practice.

Often when a community becomes conscious that a road is needed from point A to point B a situation arises which defeats the best efforts of the highway engineer. The public importunes the administrative authorities to consider the needed improvement. There follow discussion and newspaper comment until a decision to build the road is reached. A non-technical committee then decides how wide (and often how thick) the road shall be, and how much money it shall cost. Then the highway engineer is called upon to construct the highway.

If he has failed under such circumstances to produce a road of the quality, depth, width, and grade visualized by the enthusiastic community, we should not blame him too severely.

This type of procedure is very common. The county highway engineer is not allowed to plan the work in the beginning. This inferior position to which he is relegated in the procedure has probably in the past misled many a young man to the idea that his duty was correspondingly easy and could be assumed with little or no experience. But he has been rudely awakened to the realization that the community does not inquire into the conditions under which he works when failures result, but holds him responsible only for results.

If county highway engineering in many places has fallen into discredit, it is due largely, I believe, to two general classes of defects: First, that the young engineer has been led to a misconception of the job by the slight emphasis given to his specialty in college, by the poor salaries offered by counties, by the low position which he is accorded in the administrative councils preparatory to actual work, and by the absence of a distinct professional atmosphere among his fellows on which he can rely for support. Second, in the transition state through which highway work is passing the cost of good work has not yet been sufficiently emphasized and this condition allows the engineer to be misled by the civil authorities in their constant effort to secure mileage.

If the position of county highway engineer is to attain any professional dignity among the engineering group, it would seem that it must cease to be elective and must command adequate salaries. (The states averaged for engineering and inspection in 1914 about 8% on about $25,000,000 of exclusively state work; at this rate each county in Washington could have averaged $9,641 for similar items for each of the past ten years.) It is believed that county officers would prefer to make appointments to the position of county highway engineer, and such a method would avoid much conflict. If a state law could insure that such appointees qualified by examination, prepared, say, by the

(*Continued on page 174*)

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*Paper presented at the joint session of the 13th annual convention of the Washington State Association of County Engineers and the annual meeting of the Washington State Association of County Commissioners, Spokane, Wash., Sept. 6-8, 1917.

†District Engineer, Office of Public Roads and Rural Engineering, U. S. Department of Agriculture; District No. 1, Portland, Ore.

Good Roads a Municipal Problem[*]

By S. L. SQUIRE [†]

Roads form a municipal problem because our highways afford one of our largest spending departments. And all honest municipal men—and all municipal men are honest, or should be—are desirous of securing for their ratepayers one hundred cents' value for every dollar spent. It is a further problem because of the broad service the highways perform, and yet not as efficient a service as might be obtained.

The subject assigned is the better for analysis, and one may be justified in asking why are roads "municipal," and then consider some of the problems.

I have considered the question from a county standpoint with some of the representatives of the counties. My desire today is to view the subject from a provincial standpoint as affecting municipalities in order that we may get a glimpse of the bigness of the question.

Highways are "municipal" because of their ownership. They have a real and nominal ownership and an operating partner. The nominal owners are the municipalities—the real owner the Crown. The operating partner is the general public. The rolling stock is privately owned. To the nominal owners is delegated the responsibility of constructing, maintaining, and improving the roads. They, too, must defend an action for damages. They are allowed to assess the ratepayers for the necessary moneys required, and are responsible to them. The fact that highway control has been so long a municipal matter has had the tendency to narrow and not broaden the viewpoint. The standards have become local and not national. The improvement has been sectional and not continuous. This forms one of the problems.

The public as the operating partner not only uses the highway for business and pleasure, but delegates himself as road inspector and freely finds fault with all that he thinks is bad, occasionally, however, offering some helpful suggestion. The public has always considered itself warranted to elect whoever it fancied as municipal councillors and then as a reward criticize their actions, and this is not always charitably.

Let us consider of what the highways of the province consist, dealing with investment and service performed. It may not be out of place to furnish some figures which I hope may prove interesting and illuminating in connection with the ownership and development of the highway system of the province as they represent in total the "highest capitalized public owned business in Canada."

The Province of Ontario has a map measurement of roads slightly in excess of 58,000 mi. While all of these roads are not of a uniform width, they would average 60 ft. and require a land acreage for road purposes of 460,000 acres, which, if valued without the cost of improvement at $30 per acre, an average less than farm land assessment, the investment in land is worth $13,800,000. The cost of improvement, including grading, drainage, bridges and surfacing estimated at an average of $1,000 per mi., would be $58,000,000, making a total permanent investment in county roads of $71,800,000. The maintenance of the investment costs in cash and labor over $3,000,000 annually. The counties are spending at the rate of $900,000 annually. This large amount does not include the city and town streets, the capital invested in which, I like to consider as the cost of the terminals. Nearly all traffic centers on these, and the total investment in 31 cities and towns, on their street improvement, is over $20,000,000, not including land value. The 250 cities, towns and villages in the province would probably have an investment of $40,000,000; making the total roadbed investment in the Province of Ontario over $110,000,000.

This large public investment furnishes a means whereon the privately owned rolling stock may operate. The value of the rolling stock needs to be considered—the automobile, the farmers' buggies, wagons and horse power, the companies' trucks, etc. Investment in these is necessary because of the roads, and the roads are necessary because of the investment. The rolling stock investment, privately owned, reaches over $200,000,000.

Let us briefly consider highway traffic on the roads of Ontario. This, of course, can only be approximately estimated. The figures presented, however, have been submitted and carefully checked by some who have made a study of this matter. There are approximately 75,000 automobiles in the province, averaging 4,000 mi. yearly, thus traveling 300,000,000 road miles, which is 7 times the distance traveled by all the passenger trains in the Dominion of Canada. They, the automobiles, carried 60,0000,000 passengers, averaging 4 to the car, for an average trip of 20 mi. This is 1½ times the number of passengers carried by all the railroads in the province.

The necessity of the highways and the important functions which they perform, reflecting the progress of civilization, add to the problems of the municipalities. There is a greater demand for improved roads caused by traffic conditions. This illuminated the problems and caused us to consider their solution.

Considerable controversy has been occasioned by one phase of the subject—cost. Who should pay for the roads? The spirit of cooperation is now evidenced, and with government assistance the assessment for highway improvement has been placed upon the government, the cities, and the rural municiualities, paying as nearly as can be arranged in proportion to benefit. The money required may be obtained by the municipalities by annual levy or the issue of debentures. No municipality should issue bonds for any public work, having the bonds outlive the life of the work. The issuing of bonds should be discouraged. Pay as you go should be the rule and should be encouraged. The people have discovered during the past three years that money is available for important work. Bonds should never be issued for maintenance.

The necessity of trained men is emphasized in every walk of life—excepting in municipal matters—and I submit that men are often elected to fill important municipal positions, who have no qualifications except that they are considered "good fellows." The municipal council is the board of directors elected by the people to supervise the construction and maintenance of the highways in the municipality. In 95% of the rural municipalities this work is delegated to pathmasters who are appointed annually by the council. The qualifications of these pathmasters as road builders are often discovered only when a good roadbed has been destroyed. The farce of trying to create good roads by bad management is daily exposed. To obtain efficient management in road building, no one should be employed as manager or overseer who does not possess recognized qualifications, and when a man is discovered who has gained knowledge and experience he should be retained. If the municipal control of the highways is continued and good roads obtained, not only will roads have to be standardized, but men who build them will have to be standardized also.

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[*] Abstract of an address at the 19th annual convention of the Ontario Municipal Association, Toronto, Ontario, August 29-31

[†] Municipal Advisor, Ontario Department of Public Highways.

Increased speed in traveling has shown new dangers. Many roads possess sharp turns where slight differences occur in surveys. Damage actions may never occur if these are straightened by purchasing slight deviation. "Safety first" can be practiced with good effect.

Serious problems are occasioned by the number of opinions to satisfy, and by indifference on the part of ratepayers. It is often difficult to get the public to take an intelligent interest in that which is essentially its own business. The people do not realize the immense annual waste occasioned by experimenting with the highways.

Problems are prevalent not only of management and administration, but also of ascertaining just the best kind of road to build. There are men who will tell you that this or that kind of road is the kind, and only kind, to be constructed. I submit that with present-day traffic, the perfect road has not yet been discovered. That road which can be constructed and maintained at the lowest cost, keeping in mind traffic conditions and efficiency, is undoubtedly the best road. The problem is to find the road suited to your municipality. I submit that with councils changed annually this is a serious difficulty.

Problems when correctly solved prove blessings in disguise. Agitation for improved highways preceded the automobile. As "coming events cast their shadows before," the automobile has produced road problems, but I believe it is hastening the day when good roads will become an economic asset in every municipality, and this will prove a national blessing.

The public needs leadership. Legislation must not precede public opinion to too great an extent. There are municipal men today who are convinced that changes are necessary if good roads are to be obtained.

The municipal officials should be the leaders of public opinion. If by such leadership the public could obtain an appreciation of the magnitude of the good roads question, having a broader conception of the important functions the highways perform, the high place they occupy in the economy of present day civilization, and the immense waste in labor and capital occasioned by the system employed in most of the municipalities, the ratepayers in mass would demand changes in administration which would efface the problems and produce a system of good roads in our province comparable with the best highways of Europe.

Iowa's Provisions for Applying Federal Aid

Chief among the road laws passed at the 1917 session of the Iowa Legislature is the law providing for the state's acceptance of the aid extended by the United States Government under the federal aid road act. The full text of the law follows:

Section 1. That the State of Iowa. through its Legislature, hereby accepts the proposal of the United States as set forth in the Act of Congress, approved July 11, 1916, entitled "An act to provide that the United States shall aid the states in the construction of rural post roads, and for other purposes," thirty-ninth United States Statutes at Large, page 355, and assents to the provisions of said act of Congress. For the construction and maintenance of rural post roads the good faith of the state is hereby pledged to cause to be made available funds sufficient to equal the sum apportioned to the state by or under the United States Government during each of the five years for which federal funds are appropriated by Section 3 of the said act and to maintain the roads constructed with the said funds so appropriated, and to make adequate provisions for carrying out such maintenance.

Section 2. The State Highway Commission is hereby authorized and directed, as soon as may reasonably be done, to designate and select from the roads which are now, or hereafter may become rural post roads, including a part of each of the 99 counties of the state and including not less than 2,000 nor more than 6,000 mi. giving equitable consideration to the claims of each county, said system to be so selected and designated as to at least meet the requirements of the federal act and a sufficient number of miles to at least require the full appropriation provided for by the federal act during the life of said statute. Before designating the roads of such system, the State Highway Commission shall request the cooperation and assistance of the board of supervisors of the respective counties, and shall give due consideration to the judgment of each of said boards in such designations.

Section 3. The State Highway Commission is hereby authorized and directed to enter into and complete negotiations with the secretary of agriculture and to secure the full apportionment from the federal aid fund for and on behalf of the State of Iowa and the several counties thereof, and is further authorized to enter into all contracts and agreements with the United States Government relating to the survey, construction and maintenance of roads under the provisions of said act of Congress, to submit such scheme or program of construction and maintenance as may be reuired by the secretary of agriculture. to supervise and direct the work of construction on behalf of the State of Iowa and its counties, to supervise the expenditure of all funds paid out on account of such work by the counties of the state, and do all other things necessary fully to carry out the cooperation contemplated and provided for by the said federal aid road act.

Section 4. The board of supervisors of each county of the State of Iowa is hereby authorized to make application by resolution to the State Highway Commission for the apportionment to such county of its share of the federal aid fund, indicating with particularity what portion of the comprehensive system designated by the State Highway Commission in such county they desire to first improve and to clearly specify the general character of the improvement which it is proposed to make. The State Highway Commission shall act upon such application promptly and, if approved, shall prepare a project statement and when funds for its construction are available, submit the same to the secretary of agriculture for his approval, and if the same is approved by him and conforms to the terms of the federal aid road act, then the State Highway Commission shall prepare the plans and specifications for such improvement, or shall cause same to be prepared by the county engineer under its supervision, which plans and specifications shall thereupon, if satisfactory, be approved by the board of supervisors and the State Highway Commission.

The board of supervisors of said county is hereby authorized and directed to forthwith take the necessary legal action to execute and enter into an agreement with the State Highway Commission, on forms prepared by it; which agreement shall be a valid contract of the county and obligate such county to cause the improvement to be made according to said plans and specifications, and further bind the county to maintain such improved highways in the manner required by the federal aid road act and the rules made thereunder; provided, however, that such contract shall expressly provide that not to exceed an amount equal to double the amount of the federal aid fund apportioned to the county in which such project is located, shall be paid out of the federal county cooperative road fund hereinafter created.

Section 5. The State Highway Commission is hereby directed to apportion the federal aid provided for by the federal aid road act. among the several counties of the state, in the same ratio that the area of each county in the state bears to the area of the state, and shall notify the auditor of each county in writing the amount alloted to his respective county. The State Highway Commission is further directed not later than the first of March of each year, to certify in writing to the treasurer of state the amount of federal aid apportioned to the state for each year during the life of said act of Congress. Also the estimated annual expense to the State Highway Commission for plans and specifications prepared by it under the provisions of this act, which certificate shall be kept in the office of the state treasurer.

Section 6. The treasurer of the state is hereby authorized and directed to receive, from time to time, the federal funds apportioned to the State of Iowa, as provided for by the said act of Congress, and is hereby directed to open an account to be known as the federal county cooperation road fund; and to credit to such fund, from time to time, all federal aid received from the United States Government under the provisions of said act of Congress. The treasurer of the state is further authorized and directed before distributing the motor vehicle road fund to the counties, to transfer to such fund from any moneys paid into the state treasury pursuant to the provisions of chapter 2-b, title VIII, supplement to the code, 1913, as amended, an amount equal to the amount of federal aid apportioned to the State of Iowa for that year under said act of Congress, one-half of which amount shall be transferred by said treasurer of state on the first day of April and the other one-half of said amount to be transferred on the first day of August of each year during the life of the federal aid road act. The federal county cooperation road fund shall be held in trust for the sole and exclusive purpose of carrying out the provisions of the federal aid road act, and shall be used for no other purpose. The treasurer of state is also authorized and directed at the same time, and in the same manner, to transfer from said motor vehicle road fund an amount equal to the estimated cost of plans and specifications for the current year, as certified by the State Highway Commission, which shall be known as the federal aid engineering fund. The balance of the money paid into the state treasury under the provisions of chapter 2-b, title VIII, supplement to the code, 1913, shall be apportioned in the manner provided by section 1571-m32, supplemental supplement, 1915. Whenever any improvement which is being constructed under and in accordance with the provisions hereof has been completed or so far completed as to call for partial payments on the contract price under the terms of the contract, a voucher, upon forms prepared by the State Highway Commission, for the amount then due the contractor shall be made out in itemized form and verified by such contractor and presented to the State Highway Commission and the board of supervisors; and if the work thus far completed is satisfactory to such commission and the board of supervisors, and according to contract, the voucher shall be approved by the State Highway Commission, and the board of supervisors, which approval shall be in writing upon the voucher. When a voucher so prepared and so approved is presented to the auditor of state, he is hereby authorized and directed to thereupon draw a state warrant for the amount called for in such voucher upon the federal county cooperation road fund, payable to the claimant; and the treasurer of state is hereby authorized and directed to pay any such warrants out of said fund and out of no other.

The State Highway Commission is hereby authorized on the first of any calendar month to prepare a voucher for all expenses previously incurred by said commission in the preparations of plans and specifications under this act, and not heretofore reported, which voucher shall be fully itemized, verified by the state engineer, and approved by the State Highway Commission, and when such voucher so prepared and approved is presented to the auditor of state, he is hereby authorized and directed to thereupon draw his state warrant payable to said State Highway Commission, for the amount called for in said voucher on the federal aid engineering fund; and the treasurer of state is hereby authorized and directed when presented such warrant properly endorsed to transfer to the maintenance fund for the State Highway Commission the amount of such warrant out of said federal aid engineering fund and out of no other.

Section 7. In the event any county shall fail by July 1, 1920, to make application to the State Highway Commission for its allotment of federal aid funds and shall fail or neglect to enter into contract for such improvement in the manner provided for in Section 4 hereof, the said county shall be deemed to have waived its right to participate in such federal aid fund; and in such event, the State Highway Commission is hereby authorized and directed to use the allotment previously assigned to such county as hereinbefore provided, on any other portion of the comprehensive scheme of road improvement selected by them and in any county or counties which may be designated by the secretary of agriculture as best designed to aid in the completion of the post road system of the State of Iowa; provided, however, such county or counties to which such abandoned apportionment has been allotted shall provide out of any funds in their treasury and available for road purposes, an amount equal to the allotment so made to said county, which allotment and appropriation made by the county shall be expended in the manner hereinbefore provided and in accordance with the requirements of the federal aid act.

In order to aid county authorities in carrying out the provisions of the law, the State Highway Commission recently issued a supplement to its "Service Bulletin" containing an outline of the procedure to be followed by counties to secure federal aid, a standard form of application for federal aid, a standard form of contract between the State Highway Commission and county authorities, the text of the highway law accepting federal aid and a schedule showing the allotment of federal aid funds to each of the counties in the state. The application form is reproduced in the right-hand column on this page.

(Continued on Page 176.)

APPLICATION FOR FEDERAL AID

......................County

WHEREAS, the Congress of the United States has passed an act entitled, "An act to provide that the United States shall aid the states in the construction of rural post roads and for other purposes," and has appropriated funds for carrying out the provisions of said act, and,

WHEREAS, the Legislature of the State of Iowa has accepted the provisions of this act (Senate File No. 327, 37 G. A.) and has provided funds in an amount each year equal to Iowa's allotment of federal funds, all of which constitute the Federal-County Cooperative Road Fund, and,

WHEREAS, ... County's apportionment of said fund for the period covered by the federal aid act is, as certified by the Iowa State Highway Commission, $............

Note: If the county wishes to appropriate any county funds, or if any funds have been donated to aid in the project other than for buying right of way, or constructing culverts and bridges, a clause to that effect should be inserted here showing the amount of said funds.

NOW, THEREFORE, Be It Resolved by the Board of Supervisors of .... County, Iowa:

That we hereby make application to the Iowa State Highway Commission for .... County's apportionment of the Federal County Cooperative Road Fund, and that we hereby designate the following portion of the inter-county road system for improvement with this fund:

Note: Insert here a description of the road or roads to be improved. This description should be in sufficient detail to permit the project to be definitely located on the map; or a map of the county should be attached on which the project is indicated by suitable symbols. Do not use local names in designating such roads.

In selecting the roads to be improved, the board should request the county engineer to present tentative estimates of the cost according to the nature of the improvement designated by the board, and should then select only a sufficient number of miles to use up the county's allotment of the Federal-County-Cooperative Road Fund, plus any funds which the county or interested parties may wish to add to such allotment.

Under the federal law and the rules of the secretary of agriculture, the cost of extra work, engineering, inspection, and contingencies must be provided for in the original estimate. These items shall not exceed 10% of the total estimated cost of the project. Accordingly, the county engineer, in making up his tentative estimate of cost of any proposed project, shall set aside 10% of his county's apportionment to cover the cost of extra work, engineering, inspection, and contingencies, and shall then base the size of the project on the remaining portion of the county's apportionment. Should the actual cost of extra work, engineering, inspection and contingencies, be less than the 10% set aside, the unexpended balance will be used in extending the work as far as possible.

That we designate such road for improvement by

Note: Insert here a clause stating the general character of the improvement which it is proposed to make, such as:

(a) Constructing to finished grades, providing the necessary drainage and elimination of danger at railroad crossings.

(b) Constructing to finished grades, providing the necessary drainage, elimination of danger at railroad crossings, and surfacing with ....

(c) Preparing the roadbed and surfacing with .... the road having already been brought to finished grade, and the necessary drainage provided.

That we pledge the good faith of the county:

(1) To provide the funds for and cause to be constructed of permanent construction all culverts on said project, and all bridges, except as otherwise agreed upon by the State Highway Commission and the board of supervisors.

(2) To provide the necessary funds for and to secure the necessary right of way as may be required by the finished plans, and

(3) To enter into contract with the State Highway Commission to cause said road to be improved in accordance with the plans and specifications and to maintain said improvements in accordance with the federal aid road act and the rules made thereunder.

....
....
....
Passed this ....
day of ....
191....
.... Members of the Board of Su-
County Auditor. pervisors, ...
County, Iowa

GOOD ROADS

A Weekly Journal of Road and Street Engineering and Contracting.

Founded January, 1892

PUBLISHED EVERY SATURDAY BY
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Number 13

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

SEPTEMBER 29, 1917

ROAD BUILDING FAVORED BY THE WAR CONVENTION OF BUSINESS MEN

Putting road building facts before business men at the war convention at Atlantic City was urged in this column two weeks ago, and, as noted last week, the matter was brought up and a resolution presented. The plan adopted for handling resolutions necessitated referring all those accepted by the meeting to a resolutions committee for final action, and as that committee did not report until Friday, our last week's account of the meeting carried the text of the resolution as first presented. The text as reported back by the committee and finally passd is printed on another page of this issue.

While the resolution is general, it should—and, we believe, will—have a stimulating effect upon road building programs throughout the country. It serves to bring the relation between road work and the nation's commercial, industrial and military needs before the business men, who, as we pointed out here two weeks ago, have great influence in shaping public opinion. Not only was it the first time, so far as we know, that the subject had been brought before business men as a class, but the Atlantic City meeting was probably the greatest gathering of business men—including representatives of "big business"—that has ever been held.

Money to build and maintain highways must come from the taxpayers and it will not come from them unless they can be persuaded of the need for better roads. Among road builders and others who have studied the present transportation needs of the United States there is no question as to the importance of thoroughly coordinated systems of improved roads. Laymen, however, do not all appreciate how vital roads are in the economics of transportation. The great mass of the people can more readily be reached through the business men than in any other way, hence the desirability of enlisting business in the cause of good roads.

For several years prior to the time when this country's participation in the war became certain, "preaching the gospel of good roads," as the propagandists of an earlier day expressed it, had seemed unnecessary, at least in a large portion of the country. The functions of the leaders in the road building field were of a different sort. It was more necessary to urge insistence upon proper methods of construction than to advocate more construction, more necessary to urge better financing than to work for merely larger expenditures. With the coming of the war, there again arose the necessity for advocating more road building, at the same time in no way failing to emphasize the necessity of following approved methods of construction and maintenance and sound financing. For reasons several time recited at length in these columns, roads are now of greater importance to this country than ever before—and everything that brings that fact before the people is a step in the right direction.

It will be impossible to measure accurately the effect of what was done along this line at Atlantic City, but it is certain that it will produce results and we are hopeful that those results will be commensurate with the importance of the subject.

BUY ANOTHER BOND

A second issue of Liberty Bonds is soon to be sold to the general public, on terms similar to those on which the first issue was put out. Both because it is one way of helping to win the war and because the bonds are well worth purchasing for investment we wish to again urge our readers to buy.

At this writing the details of the selling plan have not been formally announced, but it is certain that provision will be made for payments in small installments and the new bonds will bear interest at 4% instead of 3½% as in the case of the first issue. The small payments spread over a comparatively long term bring the bonds—at least the $50 ones—within the reach of almost every one. The interest rate will be greater than that paid by the majority of savings banks. The safety of the investment needs no comment.

It is unfortunate that the salaries paid a large percentage of road builders do not permit any considerable purchases of securities. But this in no way releases them from the obligation to save as much as possible, though it does make saving difficult. The Liberty Bonds facilitate investment and offer an unusual opportunity to people of small means to save something.

Most of all the Liberty Bonds help to win the war—at present the first duty of America and of all her citizens.

Buy a bond to help your country and yourself.

A MARKET FOR SAND

A good market for fine sand of the proper grading for sheet asphalt work exists in New York City. As noted in the description of Manhattan Borough's methods of laying that type of pavement, printed in the issue of September 15, considerable difficulty is experienced by the Bureau of Highways in obtaining a sand that is sufficiently fine and at the same time otherwise suitable.

As a matter of fact, this difficulty has assumed troublesome proportions. In the past, the borough has obtained its supply from New Jersey. The material furnished was entirely satisfactory for a long time, but recently has deteriorated. Similar difficulty has been experienced with sand from other convenient sources.

According to Dr. Felix Kleeberg, Chemist of the Bureau of Highways, there are ample deposits of good material in the vicinity of New York, and the production of a suitable sand is only a matter of careful preparation. Asphalt sand of the proper grading for heavy traffic mixtures has been selling for approximately 90 ct. per cu. yd. A price of $1.25 or even $1.50 per cu. yd., would add but a trifling amount to the cost of the finished sheet asphalt pavement—from 1.5 to 2 ct. per sq. yd. for a 1½-in. wearing surface on a 1½-in.

binder course. The city could well afford to pay this extra cost, according to Dr. Kleeberg, in view of the better wearing surface that would be obtained with the finer sand. For the producer, an addition of 50 ct. to the present price received for same, would give a wide margin of profit.

With the Borough of Manhattan alone, leaving out of account the other boroughs of the greater city, in the market for approximately 100,000 cu. yd. of fine sand annually, it would seem worth while for some producer to install the equipment necessary for getting out the desired material.

Planning County Highway Work

(*Continued from page 169*)

State Highway Department, the result would be correspondingly better.

Working in harmony with the county authorities, well prepared, with a high sense of professional standards, and adequately paid, the county engineer may hope to achieve a first essential in planning of his work, and that is, to secure enough confidence on the part of his superiors and of the community, to allow him to expect a term of office extending over a period of years. It is idle to discuss planning of highway work unless sufficient time is presupposed to work out a plan. The public is learning by repeated failure that road reform does require time. If the county highway engineer can be insured of a reasonable tenure of office, his work will be done with greater economy in the end. The difficulty with highway work is not an inherent technical difficulty, but a political difficulty causing constant interference with the technique.

It will doubtless be granted that the first technical duty of the county highway engineer is to study his county and to make a careful record of what he finds. This record should include a map on which the highways may be classified in two ways, first, with respect to their service to the community as through roads, market roads, or neighborhood or community roads; second, with respect to their type of relative improvement. Supplementing such maps there should be carefully plotted the location of all available road material as fast as discovered, with sufficient attached data to show where such material was used, when, and with what results, and the approximate cost. In addition to such field information, it is necessary for the county highway engineer to know thoroughly the financial history of the county and particularly the past expenditures for highways, the possibility of their increase, the indebtedness of the county, the relative amount used for schools, and other purposes. With this knowledge as a basis, the county highway engineer should make it his duty to institute modern cost bookkeeping methods in all the work he does. Such cost keeping methods are summed up by the ideas of distribution of costs and development of unit costs. The reason for cost keeping is twofold—to prevent waste and inefficiency, and to enable intelligent planning of new work. State laws to this end could be made very effective.

The program for county highway work will be conditioned by the results of the field investigation and the financial history, and the effectiveness of the highway engineer will be measured by the skill with which he can develop efficiency under these limitations in a plan of road improvement for the county.

It is manifest that he must improve by new work certain miles of road each year, that he must maintain such new work with especial faithfulness, and that he must also repair additional miles of road and maintain those repaired miles, and furthermore maintain in a passably good condition the residue of the road mileage of the county. The equipment necessary for such work must be found and the distribution of expenditures must be planned.

It is a mistake for county highway engineers to take the attitude that conditions in their counties are "special conditions," that they have peculiar drainage, or subsoil or road material, and that, therefore, certain practices are permissible in that county that are manifestly against standard procedure. While it is admitted that the construction and upkeep of roads offers an endless variety of operating methods, nevertheless well tried principles underlie all such practice and only such principles will insure good results. For example, it is known absolutely that trap rock can not be bound with clay with economical results; that a boggy spot on a side-hill can not be cured by placing material on top of it.

As the number of highway engineers increases and their ideas are brought into contact at such meetings as this, opportunity is given for a more perfect standardization of work. It seems that no greater function exists for an association than to help its members realize the best methods that are known to it. We are all conscious of the feeble position of the county engineer when he attempts to report on or defend a method of work in good faith and is met by the sweeping generalities of the county board, which often sets aside his findings. Frequently the board desires to substitute methods which seem to have been elsewhere successful and yet are known by the engineer not to be the cause of the successful result presented as an illustration.

It may be that the entire highway engineering profession would be benefited by resignations when professional methods of the engineer are questioned or set aside. That many highway engineers continue in office doing work against their best judgment is unfortunate. Perhaps it is evidence that the engineers can not back up their judgment either with sufficient experience or with forceful English.

It seems to be true that the domain of highway work presents so many varied problems that chance for individual judgment is very great. It is correspondingly desirable, therefore, that highway engineers be absolutely informed as to the underlying or invariable principles that must obtain everywhere. The public must be taken into the engineer's confidence, the sympathetic cooperation of the newspapers is desirable, and it must be frequently understood that the engineer is proceeding under financial limitations over which he has little control. He must postpone the construction of much needed improvement while he brings to a passable standard many miles of road that must be traveled every winter. If he can plan for a series of years it will be possible to survey the roads and establish their profile and work gradually toward the new plan and the new profile without loss. Culverts can be installed to correct grade and length if the complete profile and plan are available. Maintenance operations can be undertaken with full knowledge of what is to follow within the next succeeding year. The purchase of road machinery may be planned economically. The installation of crushing plants may be made with a view to their use beyond a single season. The purchase of culvert pipe may be made in quantity and the general business of roads in the county handled on a permanent basis.

It would doubtless be profitable for this association to study the application of machinery to road construction. An able committee reporting a year from now on the question of the practical and economical introduction of more machinery into road building might render great service in view of an ever-increasing shortage and cost of labor. As an example the question might pertinently be asked: What labor saving devices can be applied to concrete road construction? And would not a report on this question help the highway engineer in his work?

The County Judge of Culberson County, Texas, recently presented a petition for state and federal aid on the strength of county road warrants, totaling $75,000, and received the full amount allowable, $35,000. Work on the highways of the county will begin without delay.

The Wisconsin Law Accepting Federal Aid

In order to take advantage of the financial assistance extended by the United States Government under the federal aid road act, the Wisconsin Legislature at its 1917 session enacted a measure known as the "state trunk highway law." This measure, officially designated as Chapter 175 of the Laws of 1917, is the most important act passed at the 1917 session.

The bill, as passed, was framed by a joint committee of the Wisconsin Senate and Assembly. The Senate committee was composed of Senators Lawrence E. Cunningham, Chairman, F. A. Baxter, E. F. Clark, David V. Jennings, Antone Kuckuk and George Staudenmayer. The personnel of the Assembly committee was as follows: W. Woodard, Chairman, John C. Chapple, Edward Nordman, P. Walter Peterson, A. M. Rogers, John J. Ruka and C. N. Saugen. The committee held a large number of meetings and hearings and finally drew a bill which came out with a unanimous report from the joint highway committee and the finance committee. It was passed in the Senate by a vote of 30 to 3 and in the Assembly by a vote of 73 to 13. The act in no way changes the provisions of the state aid highway law under which the towns and counties have been operating for six years past. It does, however, materially modify the state aid laws relating to villages and cities; the laws relating to the distribution of state aid within the counties, and the laws relative to bonding under the state aid law.

According to the Wisconsin Highway Commission, the state trunk highway law is the "most momentous piece of road legislation ever enacted by a legislature of Wisconsin." A brief statement of the principal provisions of the law, prepared under the direction of the commission, follows:

Section 1312: The Legislature assents to the federal aid road act and guarantees that Wisconsin will provide each year an amount equal to the federal funds available for construction, and also guarantees proper construction and maintenance of roads built with federal aid. (Required by federal aid act.)

Section 1312a: Defines certain terms used in the bill.

Section 1313: Provides that the State Highway Commission shall lay out a state trunk highway system comprising not over 5,000 mi., interconnecting every county seat and every city with a population of 5,000 or more. The system is to be laid out after due investigation and hearings by the commission, and the result for each county published in two newspapers in the county. If a legal protest is filed against the system adopted for any county, the special legislative committee of five members appointed by the governor makes a further investigation and finally establishes the system.

This section also provides for the proper marking and signing of the system by the State Highway Commission, and for the publication and sale of maps for the guidance of travel.

Section 1314: Provides that the federal aid funds, an equal amount of state funds, and an equal amount of county funds shall be dedicated to new construction on the state trunk system. The joint federal and state funds are allotted to the counties one-third on the basis of area, one-third on the basis of public road mileage, and one-third on the basis of valuation.

The county is required to furnish for construction an amount equal to one-half the joint state and federal aid funds, therefore each county must pay one-third of the cost of work done in that county.

This section also provides that up to 50% of the county's share of the cost (16⅔% of the whole cost) may be charged against the unit of government in which work is done if the county board so decides. In no case is a town to be assessed more than $1,000 per mile of road built.

Section 1315. Provides for surveys, plans and estimates for construction. Under the federal act this work must be performed under the immediate direction of the State Highway Commission.

This section also provides that if a county shall fail to make available in any year its share of the cost of an improvement determined upon by the State Highway Commission, the county's share shall be levied against the county by the secretary of state, collected, paid into the state treasury, and dedicated to the special improvement. This is necessary to insure construction of roads absolutely necessary from the standpoint of intercounty travel but possibly not of supreme importance to the county in which they lie.

Section 1316: Provides for construction by contract after the plans, etc., have been approved by the United States Department of Agriculture, and for adequate inspection of the construction.

Work shall be let by contract to the lowest competent and responsible bidder unless it is found impossible to let a contract at reasonable prices, in which case work may be done by day labor.

Section 1317: Provides for the maintenance of the whole trunk line system by county forces under the general direction of the State Highway Commission. This applies not only to the sections which have been built under the state aid law or federal aid law, but also to the sections which have not yet been so built.

The county forces perform the maintenance, which, when satisfactory to the State Highway Commission, is paid for out of the proceeds of automobile license fees.

Section 20.49: Creates a state trunk highway appropriation made up of funds paid into the state treasury by the federal government, by the counties, and of the state's share of the automobile license fees.

Sctions 1636-47; 20.04, etc.: Increase the motor vehicle fees and amend their distribution. Fees for all automobiles are made $10; motorcycles, $4; garages, $25; and for trucks when used in the country from $15 to $25; for trucks when used in the city $10.

The present rates will apply until December 30, 1917, the new rates going into effect January, 1918.

The license funds available for distribution to the counties and state, July, 1917, go back to the counties on the old basis, and to the state on the old basis, the state's portion being used to finance construction on the state trunk sysem.

Fees collected after June 30, 1917, are apportioned as follows:

(1) The secretary of state subtracts his cost of collection.

(2) One-fourth of the remainder is returned to the counties, in the ratio of payments, to be used for maintenance on roads not on the state trunk system, but on the state highway system.

(3) Three-fourths of the remainder is added to the state trunk highway appropriation and is used as follows:

(a) There is first subtracted the cost of administration by the State Highway Commission.

(b) There is then taken out to pay the state's share of the cost of construction on the trunk line system an amount equal to the federal appropriation.

(c) The remainder is allotted to the counties in the ratio of the trunk highway system lying in each county, and is paid to the counties when the counties have maintained the trunk line system within their limits to the satisfaction of the State Highway Commission.

It will be noted that the whole cost of licensing motor vehicles in the secretary of state's office, the cost of administrating the federal aid road act by the Wisconsin Highway Commission, the state's share of the cost of construction of federal aid roads, and the whole cost of maintaining the state trunk highway system is defrayed out of the proceeds of automobile license fees. Besides this, each county will get back for use in maintaining the county system of highways about 2¼% of all motor vehicle fees received from the county. Motor vehicle fees, therefore, defray the whole cost of the state of this trunk line project except one-third of the cost of construction required to be paid by the counties, which must be raised by direct county taxes.

Section 6: This so-called "war rider" was added as an amendment before final passage. It provides that in case of absolute necessity construction work may be suspended except that part of it absolutely necessary to be done to prevent the state from losing federal aid funds. In case construction work is suspended, or practically so, funds may be temporarily transferred to maintenance purposes, the idea of the Legislature being that no matter what occurs it is advisable to maintain the state trunk highway system even if nothing else can be done.

◆

The Construction of 5 Mi. of the William Penn Highway, between Huntingdon and Millcreek, Pa., is practically completed. This is a concrete road.

The Sale of the Platte River Toll Bridge at Ashland, Neb., to the state and the counties of Sarpy and Saunders is urged by all who desire to have the Omaha-Lincoln motor highway approved for federal aid, which under government regulations is not available for any project involving the use of a toll bridge.

Iowa's Provisions for Applying Federal Aid

(*Continued from page 172.*)

The total allotment of federal funds to the State of Iowa on the present basis of distribution will amount to approximately $2,192,500 during the five years covered by the federal aid act. The approximate allotments to the counties have been made as shown in the following table, in which the amount given is that to be obtained from the federal treasury. To this will, of course, be added an equal amount by the state, bringing the total expenditure for federal aid work to approximately $4,382,000. The latter sum forms the federal-county-cooperative road fund referred to in the law.

APPROXIMATE ALLOTMENTS OF FEDERAL AID FUNDS TO IOWA COUNTIES

County	Area (sq. mi.)	Approximate Allotment of Federal Funds	County	Area (sq. mi.)	Approximate Allotment of Federal Funds
Adair	573	$22,375.65	Jefferson	431	$16,830.55
Adams	427	16,674.35	Johnson	611	23,859.55
Allamakee	671	26,202.55	Jones	569	22,219.45
Appanoose	513	20,032.65	Keokuk	578	22,570.90
Audubon	443	17,299.15	Kossuth	974	38,034.70
Benton	712	27,803.60	Lee	545	21,282.25
Black Hawk	566	22,102.30	Linn	717	27,998.85
Boone	573	22,570.90	Louisa	426	16,635.30
Bremer	434	16,947.70	Lucas	432	16,869.60
Buchanan	567	22,141.35	Lyon	582	22,727.10
Buena Vista	580	22,649.00	Madison	563	21,985.15
Butler	577	22,531.85	Mahaska	575	22,453.75
Calhoun	571	22,297.55	Marion	577	22,531.85
Carroll	572	22,336.60	Marshall	572	22,336.60
Cass	564	22,024.20	Mills	447	17,455.35
Cedar	578	22,570.90	Mitchell	463	18,080.15
Cerro Gordo	575	22,453.75	Monona	708	27,647.40
Cherokee	573	22,375.65	Monroe	433	16,908.65
Chickasaw	497	19,407.85	Montgomery	424	16,557.20
Clarke	428	16.713.40	Muscatine	455	17,767.75
Clay	573	22,375.65	O'Brien	569	22,219.45
Clayton	790	30,849.50	Osceola	395	15,424.75
Clinton	709	27,686.45	Page	531	20,735.55
Crawford	715	27,920.75	Palo Alto	572	22,336.60
Dallas	592	23,117.60	Plymouth	861	33,622.05
Davis	502	19,603.10	Pocahontas	580	22,649.00
Decatur	533	20,813.65	Polk	596	23,273.80
Delaware	571	22,297.55	Pottawattamie	958	37,409.90
Des Moines	429	16,752.45	Poweshiek	580	22,649.00
Dickinson	411	16,049.55	Ringgold	540	21,087.00
Dubuque	616	24,054.80	Sac	576	22,492.80
Emmet	417	16,283.85	Scott	470	18,353.50
Fayette	724	28,272.20	Shelby	589	23,000.45
Floyd	495	19,329.75	Sioux	760	29,678.00
Franklin	578	22,570.90	Story	567	22,141.35
Fremont	522	20,384.10	Tama	720	28,116.00
Greene	576	22,492.80	Taylor	534	20,852.70
Grundy	501	19,564.05	Union	427	16,674.35
Guthrie	597	23,312.85	Van Buren	490	19,134.50
Hamilton	570	22.258.50	Wapello	438	17,103.90
Hancock	573	22,375.65	Warren	571	22,297.55
Hardin	569	22,219.45	Washington	559	21,828.95
Harrison	712	27,803.60	Wayne	524	20,462.20
Henry	427	16,674.35	Webster	723	28,233.15
Howard	468	18,275.40	Winnebago	399	15.580.95
Humboldt	434	16,947.70	Winneshiek	686	26,788.30
Ida	430	16,791.50	Woodbury	878	34,285.90
Iowa	583	22.766.15	Worth	399	15,580.95
Jackson	649	25,343.45	Wright	578	22,570.90
Jasper	730	28,506.50			

Many of the counties have already made formal applications for their allotments of federal and state aid funds and in a number of counties formal project statements have been prepared. In a few counties work has advanced to the making of preliminary investigations and estimates of cost.

Prison Labor in Missouri

The initial step toward the employment of convict labor on Missouri road work under the new highway laws was recently taken by Montgomery County in requesting the State Highway Board and the State Prison Board to furnish from 25 to 100 prisoners for use in special road districts. An 8-mi. stretch of highway in the Mineola Road District will be the first to receive the benefit of this class of labor. The improvement is on the Old Trails Road, long regarded as a barrier to cross-state traffic north of the Missouri River.

The rate of $1.25 a day has been fixed by Governor Gardner for convict labor on the roads. The prisoners are fed, clothed, transported and guarded by the state. It is proposed to introduce the honor system in the use of this labor. About 500 convicts, it is reported, are now available for the work.

Sangamon County, Illinois, Proposes a Road Bond Issue of $500,000.

The board of supervisors of Sangamon County, Illinois, has decided by resolution to call a special election for November 6, in order to submit to popular vote a proposal to bond the county for the sum of $500,000 for highway improvement.

Approximately one-half of the amount—representing the county's portion—is required for improving the Chicago-Peoria-St. Louis Road in Sangamon County. In the event of the passage of the state bond issue of $60,000,000, one-third of the cost of the state and federal aid road to the county will be refunded.

The proposed county bond issue will also provide for the improvement of the Beardstown Road and other highways.

War Emergency Road Maintenance

The State Highway Department of Pennsylvania is working in cooperation with the National Defense Commission of the United States Government, and has sent P. M. Tebbs, Consulting Engineer of the department, as a delegate to Detroit, Mich., to attend a conference of various state engineers for the purpose of deciding what roads should be maintained as war emergency roads, in order to relieve the freight congestion and to secure prompt deliveries of supplies during the war.

The department is now engaged in repairing the Turtle Creek Hill, in Allegheny County, and has agreed to put a force of men and trucks on the 12 mi. of dirt road in Beaver County, running out to the Ohio state line. The road will be kept open all winter, and snowdrifts removed promptly so that it will not be blocked at any time.

Owing to freight car shortage, automobiles and trucks for eastern cities are now being transported in large numbers from Detroit and Cleveland over the highways. It is said that statistics recently produced at a conference in Pittsburgh showed that approximately 200 automobiles and trucks would be delivered in this way daily, thereby releasing thousands of freight cars for other uses.

Georgia Highways Approved as Federal Aid Projects.

The Atlanta to Macon Highway in Georgia, which is regarded as the most important road in the state, has been approved for federal aid and will be constructed as soon as details relating to other projects are completed. It is stated that the work may begin by Oct. 1.

The building of this road is regarded as imperative because of the large volume of north and south vehicular traffic which it carries, and because of the existence of military camps and supply depots at either end. The present road, to a great extent, is of earth containing a large amount of clay but it is permanently improved in Fulton and Bibb Counties. The sum of approximately $180,000 will be applied to its construction, half of the amount to be paid by the counties. This will provide for an expenditure of $2,000 per mi.

The balance of the first year's apportionment, $45,000, will be used on projects in Waldron and Brooks Counties.

A year's delay in the approval of the Atlanta to Macon Highway was partly due, it is stated, to the fact that 25% of the mileage is not used at present as rural mail routes, although it is probable that such use will be made of those portions in the future.

Division Engineers Appointed in Texas.

W. M. Forshee, John D. Meriwether and M. C. Welborn have been appointed division engineers of the Texas State Highway Commission, the assignment to a special territory to be made later. Each will receive a monthly salary of $200.

Military Road Plans Approved for Cook and Lake Counties, Illinois.

The roads and bridges committees of Cook and Lake Counties, Illinois, have agreed upon plans for the military highway between Chicago and Milwaukee, the estimated cost of which is $759,000. The Government and state appropriations for the work amount to $400,000; it has been decided to raise the balance by bond issue—$200,000 in Lake and $159,000 in Cook County.

Bond Issues Carried in Texas

Road District No. 1 in Navarro County, Texas, recently carried a bond issue of $200,000, while an $80,000 issue was passed in the Richland Road District. In Eastland County, $130,000 was voted Sept. 13. Road District No. 2 in Anderson County will issue bonds for $20,000; Omaha Road District in Morris County, $35,000; and the Freeport Road District in Brazoria County, $200,000. The latter was carried by a vote of 66 to 0.

The following bond elections have been ordered: Scurry County, Oct. 13, $100,000; Road District No. 1, Ward County, Oct. 13, $60,000; Jasper County, Oct. 13, $500,000; Tom Green County, Oct. 20, $200,000; Road District No. 3, Hunt County, Oct. 27, $50,000.

To Build Lyndale Avenue Bridge in Hennepin County, Minnesota.

Bids for the construction of the Lyndale Avenue bridge across the Minnesota River in Hennepin County, Minnesota, will be received by the county commissioners on Oct. 8, as previously noted in the "Contract News" department of "Good Roads." Bids are asked on four types of structure, each calling for a draw or lift span, necessary to provide a 55-ft. clearance for river navigation. The bridge proper will have a length of about 800 ft.

The project includes 7½ mi. of improved road leading to the Hennepin County approach, and 10 mi. on the other side of the river in Dakota County, for the construction of which Hennepin is offering for sale $427,500 in bonds and Dakota County, bonds for $22,500.

Postal Truck Bill Introduced in Congress

An appropriation for the establishment of experimental postal routes for the delivery of farm produce has been introduced in Congress by Representative John A. Moon, of Tennessee. The plan contemplates a motor truck service covering a radius of 50 mi. from city centers. Its aim is stated in the measure, as follows:

> To promote the conservation of food products and to facilitate the collection and delivery thereof, from producer to consumer, the Postmaster General is hereby authorized to conduct experiments in the operation of motor vehicle truck routes in the vicinity of such cities of the United States as he may select, and under such rules and regulations as he may prescribe, and the cost of such experiment may be paid by the Postmaster General out of any of the unexpended funds of the Postal Service; and the Postmaster General shall report the result of such experiments to Congress at the earliest practicable date.

The proposed experiment has the endorsement of the Post Office Department. In a statement made by one of the officials of the department as to what the service would accomplish, it is said that it will "provide a direct means of communication and conveyance between mailing patrons in cities and rural territory that it is not possible to provide at minimum cost to the Postal Service or to the patron at this time." It is also expected that the service would aid in reducing the cost of living by the elimination of present expensive means of communication, that it would conserve farm products now going to waste, and that it would save the time which the producer now uses in conveying the produce to market as the service would extend to actual farming territory, instead of merely suburban districts.

The plan now prevailing in the disposition of produce handled on rural routes will be followed, if the measure is passed, under the direction of an agent of the Post Office Department whose duty it will be to encourage direct delivery from producer to consumer. It involves the establishment of regular schedules and facilities for handling produce at points where it may appear for transmission.

Award of Contracts for Road Construction in McKean County, Pennsylvania

Two road contracts were awarded by State Highway Commissioner O'Neil at Harrisburg on Sept. 24. These were for the construction of highways in McKean County which will pay one-half the cost in both instances.

The road in Wetmore Township extends from the Kane Borough line to Kanesholm, a distance of 22,101 ft. The contract was awarded to Larson & Pasouzzi, of Kane, on a bid of $144,249.80.

The other contract calls for the construction of 8,367 ft. of reinforced concrete pavement, 16 ft. wide, extending from the intersection of the road to Olean, N. Y., to the New York State line where it connects with the improved state highway system of New York. Lawrence Schultz & Sons, of Fredonia, N. Y., received the contract, their bid being $43,777.

Previous reference to the above work has been made in these columns.

Street Paving in Minneapolis, Minnesota.

At the close of the paving season the City of Minneapolis will have expended more than $1,000,000 for grading and paving, according to recent advices, and will have laid 175,000 sq. yd. of creosoted block paving at $2.70 per sq. yd. as against $2.50 per sq. yd. last year.

The largest project of the year is the paving of Minnehaha Ave., from Lake St. to 49th St. A part of the work on this avenue was completed last year, and it is expected that the remaining nine blocks will be laid this fall. The cost of paving the avenue for the entire distance will be $140,000.

The following projects have been completed: Royalston Ave., from Western Ave. to 6th Ave. N., $28,142; University Ave., N. E., 3d Ave. to Broadway St., $33,866; E. Franklin Ave., 27th Ave., S., to Seabury Ave., $23,567; 5th St., N. E., between 4th and 13th Aves., $33,300; 7th St. N., between Hennepin and Plymouth Aves, started last year, $18,956; Plymouth Ave., between Lyndale and Humboldt Aves., $11,560.

The construction of the 3d Ave. S. Bridge, begun in 1912, will be completed this fall, at a cost of $800,000.

The Brunswick-Waycross Highway in Georgia, which connects the central route of the Dixie Highway, at Waycross, with the sea coast route of the highway at Brunswick, is to undergo improvement in the immediate future, according to report.

The County Commissioners of Marion County, Indiana, recently sent a formal invitation to highway officials and others to be present at the dedication of the first permanent section in Marion County of the National Old Trails Road at Indianapolis, Ind.

Convict Labor on Maryland Roads is recommended only "as an emergency" by the prison committee of the grand jury, which states that the use of such labor is "fraught with danger, difficulties and expense and is not likely to prove satisfactory in the long run."

MEETINGS

Calendar of Coming Meetings

Oct. 9-12.—League of Kansas Municipalities.—Annual convention, Wichita, Kan. Secretary C. H. Talbot, University of Kansas, Lawrence, Kan.

Oct. 16-19.—Southern Appalachian Good Roads Association.—Ninth annual convention, Nashville, Tenn. President, Henry Robert, Bristol, Va.

Oct. 17-18.—League of Minnesota Municipalities.—Fifth annual convention, St. Cloud, Minn. Secretary-Treasurer, Richard R. Price, University of Minnesota, Minneapolis.

Oct. 29-30.—Oklahoma Society of Engineers.—Annual convention, Oklahoma City, Okla. Secretary-Treasurer, H. V. Hinckley, Oklahoma City, Okla.

Nov. 19-24.—City Managers' Association.—Annual meeting, Detroit, Mich. Secretary, W. L. Miller, City Manager, St. Augustine, Fla.

Nov. 21-24.—National Municipal League.—Twenty-third annual meeting, Hotel Statler, Detroit, Mich. Secretary, Clinton R. Woodruff, 703 North American Building, Philadelphia, Pa.

Dec. 4-6.—American Association of State Highway Officials.—Annual meeting, Hotel Jefferson, Richmond, Va. Acting Secretary, H. M. Berry, Chapel Hill, N. C.

Jan. 15-17, 1918.—Virginia Good Roads Association.—Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

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American Association of Park Superintendents

The program of the meeting of the American Association of Park Superintendents, which was held recently at St. Louis, Mo., consisted largely, as previously noted in these columns, of inspection tours of the park system of that city. The meeting was addressed by Nelson Cunliff, Park Commissioner of St. Louis. Prof. Laurie P. Cox, of Syracuse University, delivered a lecture on "Tree Planting in New York." "National Parks" was the theme of an address by Horace M. Albright, Assistant Director of National Park Service, Washington, D. C.

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Society for Street Cleaning and Refuse Disposal

The abandonment of the annual meeting of the Society for Street Cleaning and Refuse Disposal of the United States and Canada has been decided upon by the Executive Committee of the society on account of conditions resulting from the war. It is stated that manufacturers and dealers, who compose the associate membership of the society, are, in a majority of cases, so occupied with business growing out of the extreme activity in the metal industries that they would be unable to give time to the convention.

In place of the convention, provision is being made for a special report. Jos. R. Buchanan, Secretary-Treasurer, has sent a circular letter to the members of the society requesting them to submit before Nov. 1, 1917, such papers, queries, or suggestions as they would have presented had the convention been held. It is proposed to edit and publish the submitted matter in circular form, including important items which ordinarily would be included in the annual report, and to mail a copy of the pamphlet to each member of the society, to each technical publication, and to any interested persons, upon request.

Resolution Adopted by the Chamber of Commerce of the United States of America

As noted in last week's issue, a resolution urging road improvement as a war measure was introduced and accepted at the war convention held under the auspices of the Chamber of Commerce of the United States of America at Atlantic City, N. J., Sept. 17-21. The resolution after acceptance by the meeting was referred to the Resolutions Committee which reported on Friday too late to permit the printing of the resolution in its revised form in the issue of Sept. 22. The full text of the resolution as finally adopted—differing only slightly from the original, as offered—is as follows:

> WHEREAS, It is essential that all the transportation facilities of the nation should be brought to the highest state of efficiency in order that foodstuffs may be moved most economically from the farm to the market, that manufactured products be moved at the lowest cost from the factory to the consumer, and
>
> WHEREAS, The public highways offer a good, prompt and economical means to supplement transportation by rail and water, therefore,
>
> BE IT RESOLVED: That the prompt improvement of our public highways is important and should be forwarded in every proper way.

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The Burlington Way Association will conduct a sociability and inspection tour from Jacksonville, Ill., to Corinth, Miss., starting Oct. 15. The pilot car will be occupied by the officers of the association.

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The election of officers of the Trans-Alleghany Good Roads Association, which occurred at the third annual convention at White Sulphur Springs, W. Va., as recently noted in these columns, resulted in the renaming of all officers for the coming year. They are as follows: President, George W. Stevens, Richmond; Vice President, W. A. MacCorkle, Charleston; Secretary, A. S. Johnston, Union; Treasurer, Decatur Axtel, Richmond.

PERSONAL NOTES

Charles S. Vorse, of Des Moines, has been appointed Assistant County Engineer of Pottawattamie County, Iowa.

W. J. Powell, Assistant City Engineer of Dallas, Texas, is now a captain in the Engineers' Reserve Corps, stationed at Fort Leavenworth, Kan.

Boyd Walker, former Assistant County Engineer, is now County Engineer of Pottawattamie County, Iowa. He succeeded Marshall Howard, now in military service.

J. A. Jackson, of the Engineering Department of Seattle, Wash., has been given leave of absence on account of his service as major in the Signal Corps of the United States Army.

W. A. Carnine, of Osceola, has been appointed Highway Commissioner of Polk County, Nebraska, under the present law requiring counties to employ such officials. The salary of the office is $100 per month.

Anson Marston, Member of the Iowa State Highway Commission, and Dean of the Engineering Department of Iowa State College, has been called to service as major in the Iowa National Guard. He is on leave of absence from the college.

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Oiled Earth Roads in Illinois

BY B. H. PIEPMEIER*

On account of the very large mileage of earth roads throughout the country and the rapidly increasing demand for improved highways it seems that one of the greatest fields for highway engineering lies in improving and maintaining the earth road to its maximum serviceability. This seems necessary, at least until the time when it will be possible for the main roads to be constructed with a more durable wearing surface.

It is evident that a road must satisfy all of the social and commercial requirements of a community if it is to be entirely satisfactory. The great problem among engineers is to select the type of improvement that will approach all requirements at the minimum cost. There is a rapidly increasing interest in improvements that will meet the social demand of our country. In fact, this social demand seems to far exceed the commercial demand. There are a great many roads in Illinois that receive a very large amount of pleasure traffic and are therefore serving primarily a social purpose. Many such roads are so located that they cannot be improved with a hard surfacing material for a great many years. It is evident, therefore, that they must be maintained as earth roads, and in such a way as to satisfy, largely, the social requirements of the community.

Our highways cannot be improved as rapidly as the public would like, largely on account of the time and money required. It is evident, therefore, that a great many earth roads must be maintained as such for many years to come. In view of this situation, it has been the problem of road builders to devise some inexpensive treatment for the earth road that would increase its serviceability.

The use of the road drag has been recognized as the most economical means of increasing the serviceability of an earth road. No one will dispute the economy of such maintenance. However, the rapidly increasing pleasure traffic is demanding a road surface that is more serviceable than the ordinary earth road.

The oiling of the earth roads seems to satisfy in a measure at least the requirements of a very large proportion of both social and commercial traffic. It is being recognized that the oiled earth road is not permanent and that it will not serve as great a volume of traffic as the hard-surfaced road. However, the intelligent use of the road drag and

AN OILED EARTH ROAD ON WHICH TWO APPLICATIONS OF OIL HAD BEEN MADE—ABOUT 4 GAL. OF OIL PER TREATMENT—PHOTOGRAPHED IN NOVEMBER

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*Maintenance Engineer, Division of Highways, Illinois Department of Public Works and Buildings.

AN EARTH ROAD JUST AFTER TREATMENT WITH ½ GAL. OF OIL PER SQ. YD.

road oil has made it possible to use the earth road with entire satisfaction for at least nine months in the year. It is very evident that the oiled road is best during the nine months of heaviest use. It is, therefore, satisfying a very large percentage of the traffic, and on this basis its annual cost is justified.

The main purposes of oiling earth roads are: (1) to suppress the dust nuisance, (2) to waterproof the earth surface, and (3) to aid in maintaining a smooth wearing surface.

The suppression of the dust nuisance is becoming very important in view of the rapid increase of pleasure traffic. On many of the earth roads in Illinois the annual cost of surface oiling can be justified on this basis alone. A heavy dust is very injurious to health, to clothing and to vehicles and is disagreeable in a great many other ways. The value of eliminating the objectionable features of dust cannot be measured in dollars and cents, but it is becoming evident that on a great many of our main traveled earth roads pleasure traffic is willing to pay the additional cost of surface oiling for the resulting pleasure and convenience.

The intelligent use of oil on an earth road not only suppresses the dust, but prevents the formation of mud during the spring, summer and fall rains. This again is vitally important on many earth roads, as traffic is demanding a road surface that will permit pleasure riding during a large portion of the year. The commercial, as well as the social, use of our public highways requires that a few main roads be so treated that there is some assurance of being able to return from an errand or pleasure trip.

The oiled earth road is meeting the expectation of a great many road builders, as its surface satisfies practically all traffic during the eight or nine months of heaviest use. It is recognized by all road users that the earth surface cannot be surpassed when it is in good condition. There is a personal satisfaction in driving over an oiled earth road on account of its resiliency, smoothness and freedom from dust and mud. At least all who have driven over oiled earth roads have soon become very enthusiastic over this road surface, regardless of its annual cost or durability.

AN ILLINOIS OILED EARTH ROAD—PHOTOGRAPH TAKEN ABOUT A WEEK AFTER TREATMENT

A well constructed earth road is essential as preparatory to the construction of any type of improvement. For this reason, maintenance of an earth road by dragging and by annual applications of road oil is justifiable in a great many cases. An earth road which has been intelligently maintained with road oil soon acquires an oiled soaked earth crust that has some value as a foundation. When an earth road is in such condition, it lightens the construction of a hard road or at least adds to the durability of any future improvement.

Earth or oiled earth roads in some cases may be inadequate for the traffic imposed upon them. This, however, is not considered as serious from economic considerations as the construction of a type of pavement that is beyond the requirements of traffic. The cheaper types of improvement can be economically improved as traffic requirements increase, while the higher type improvement, if in excess of the requirements of traffic, may prove uneconomical on account of its high first cost.

AN OILED EARTH ROAD—SHOWING CONDITION OF SURFACE AFTER SECOND TREATMENT

Unquestionably, there will be a great many oiled earth roads constructed from time to time. It would seem to be the duty of the engineer, therefore, to devote some study to this type of construction, in order that all such work may be done in the best possible way.

Earth roads should not be oiled until they have a permanently established grade and all drainage structures have been built. Unless this permanent grade is secured, a thoroughly compacted and oiled soaked foundation will be of no use for later improvements. After the proper grade has been established, extra precautions should be taken to assure the rapid removal of all surface and underground water. The success of an earth or oiled earth road depends more upon adequate drainage than does the success of perhaps any other type of road. The earth surface must be depended upon to take the wear imposed by traffic, and to do this it is necessary that it be kept dry at all times. It is evident, therefore, that almost any expense necessary to keep the oiled earth road dry is justifiable. Where an earth road has the proper cross section, side ditches and underdrainage, the oiled soaked earth crust will approach its greatest serviceability.

After the construction features have been properly taken care of, the next most important operation in securing a satisfactory oiled earth road is to have the proper surface. The prime objects of oiling an earth road are the suppression of the dust and the maintaining of a smooth and waterproof surface. It is very necessary, therefore, that an earth road be oiled when it is smooth, free from dust and in a condition to absorb the oil. Oil applied on dust will not penetrate the road surface, but will merely mix with the loose material to make an oil-dust surface that is apt to fly readily and become a nuisance. The surface should be perfectly smooth and free from low places that will retain water. The oiling of a mud-hole will not remedy the trouble but will often aggravate it. One of the chief duties of oil is to shed surface water; hence if the road is not perfectly smooth and drainage properly provided for, the main purpose of the oil will be defeated. There seems to be no objection to oiling an earth surface that is slightly moist, in fact the best results are obtained when oil is applied on the road when it is free from mud or dust, but only sufficiently dry on top to prevent sticking.

After the road has been prepared, the oil should be applied at the rate of ¼ to ½ gal. per sq. yd. of surface. If the road has never been oiled, or if more than one season has elapsed since a previous oiling, it will be found that about ½ gal. per sq. yd. will be required. If the road or street has been oiled regularly, ¼ to 1/3 gal. per sq. yd. will usually be satisfactory. It is much better to apply a small amount of oil twice each season than to put on the full quantity in one application. When too much oil is applied it is not only wasted but it is often very disagreeable to traffic.

After a road has been oiled for several years, one light application each year may be sufficient, or at least equal in results to two applications per year on a new oiled road.

The time for oiling will necessarily vary considerably depending upon the season. Favorable times for applying the oil are April and September.

The uniform distribution of the road oil is one of the essential requirements for success: The distribution can best be made by a regularly designed oil distributing wagon. All such wagons should be equipped so as to permit a pressure of at least 15 lb. at the nozzles and be equipped with heating attachments for holding or raising the road oil to the proper temperature when it is being applied to the road.

A great many have made inquiry in regard to results obtained from different grades of oil and also from use on varied kinds of soil. It is still debatable whether or not we are justified in using the cheapest grades of oil. Present indications are that better results are obtained from the use of an asphaltic or semi-asphaltic oil that contains from 40 to 60% residue of a sticky nature, and on an earth road that contains considerable clay. It is very important that the oil be applied at a temperature that will insure penetration into the earth surface. Any oil that is inclined to lie on top of the road will form a hard crust that is objectionable.

After an oiled earth road has been constructed a great deal depends upon the road being constantly maintained. The drainage and maintenance on all types of roads should be constantly attended to if the best results are desired. It is perhaps more necessary on the earth or the oiled earth road as the earth surface becomes easily displaced under traffic and if it is not restored immediately it will soon become serious.

Oiled earth roads require one or more annual applications of oil besides an occasional dragging. The annual maintenance, therefore, under normal conditions in Illinois and where the volume and nature of the traffic justifies an oiled earth road, would average approximately $250 per mi. for a 15-ft. road.

The average user of a road will become enthusiastic over the merits of any type which serves his purpose and which he finds in good condition for an appreciable distance. It seems, therefore, that he should have little regard for the type of road as long as the surface is smooth, satisfactory and serviceable. While it is recognized that an oiled earth road is a not a durable type, nor will even replace what is generally recognized as a hard-surfaced road, yet, on a great many highways, it seems to satisfy the traffic. The service given during the nine months of heaviest use apparently justifies its cost on a few of the main roads. At least, it serves as a medium of relief until such time as traffic demands a higher type of construction, or until the community is able to finance the more permanent improvements.

Heavy Traffic for Roads and Roads for Heavy Traffic

That roads must be built for heavy traffic and that increasing amounts of goods are to be transported over the highways in the future were two points made by Chairman Edward M. Hines of the Board of County Road Commissioners of Wayne County, Michigan, in an address at the Michigan Good Roads Field Day at Cass City late in August.

Early in his address Mr. Hines called attention to two portions of the new road laws of Michigan which were reviewed at some length in "Good Roads" for September 15. One of these is the section making it unlawful to move "any traction engine or similar heavy machinery over the public highways, by its own power or otherwise, during the months of March, April and May, or at any other time if, by reason of the thawing of frost, or rains, or any other cause, the roads are in soft condition, rendering them unfit for passage over them of such heavy machinery without damage to the highways." The other was the section of the law regulating the operation of vehicles, which limits the loads that may be carried on tires of various widths.

Mr. Hines expressed the opinion that the municipalities might profitably take note of changing traffic conditions and plan and build roads accordingly, for within reasonable limits "roads should be built for the traffic and not traffic fitted to the road surface." The present tendency of traffic is toward greater speed, wider gauge and heavier loads, and roads built to carry this traffic must be rigid if they are to give satisfaction. He also pointed out that it must be remembered that an improved road attracts an increased traffic—not only an increased use of the road by those living along it, but also by others who come from long distances. For these reasons an improved road must be built with a view of accommodating not the traffic that it has carried, but a traffic "at least three times as great."

Referring to conditions in Wayne County, Mr. Hines stated that during the first six months of the present year more motor trucks were licensed in that county than there were automobiles of all kinds in the entire state ten years ago. A count made on Woodward Avenue Road in September, 1912, according to figures in Mr. Hines' address, showed that 5,852 vehicles passed a given place in 24 hours while a recent count showed that 11,044 vehicles passed the same place in 11 hours and 45 minutes.

Mr. Hines stated that he believed that in the future the short-haul business, both freight and passenger, of the entire country would be done by the motor truck with trailers and by the motor bus, and that the coming of this condition would be hastened by the building of roads that would stand up under the traffic.

We have reached a period, according to Mr. Hines, when traffic is becoming so heavy and dense that more power is required, and power in any form costs money. The reduction in cost of the power for transportation purposes is becoming a problem. Feed and fuel are increasing in price, the prices of the materials used in the manufacture of freight and passenger vehicles are rising, and the price of labor is becoming greater. There is only one way at present to reduce the cost of power, and that way is to "get it out of the road." This, he stated, can be done only by building a roadbed so smooth, so rigid and so durable that a given amount of power will pull a greater load at a greater speed.

The freight highway, Mr. Hines believes, is only a few years ahead. Traffic, under the pressure of growing tonnage, is turning back to the public highway and in thickly populated centers it can no longer be confined to tracks, and long-distance, high-power motor truck lines have already been established in some places. The problem of moving crops for distances of 40 mi. or less will be solved by motor trucks and by teams, and the probabilities are, according to Mr. Hines, that motor truck owners in cities will do an increasing business in the moving of farm products just as motor truck owners are now transporting other kinds of freight between cities.

The Commission Form of Government for Counties*

By N. W. DURHAM†

Three thousand counties in the United States expend annually one-half as much money as is yearly expended by the national government. They are making these vast expenditures of the people's money under a primitive, pioneer form of local government, which has not altered appreciably in a century and which, however suited to the conditions of fifty or a hundred years ago, is unsuited to modern life and its complex relations.

"The county," some one has said, "is about the only institution that is absolutely headless." And the New York Short Ballot Association adds that, while theoretically the county's governing board is the board of supervisors, "about all the board can do is to raise money for other officials and watch them waste it."

The remedy for these ills is the short ballot and commission form of government, and we shall begin this discussion with a definition of the principles of short ballot reform:

1. Only those offices should be electve which are important enough to attract the voter to the polls and induce him to make a critical examination of the qualifications of each man who is a candidate for office. All other officers should be appointed.

2. Very few offices should be filled by election at one time so that adequate and unconfused examination of the candidates would be possible.

This is not a partisan movement. It has the approval of practically every political economist in this country, including the earnest support of the President of the United States and both living ex-presidents:

President Wilson: "I believe that the short ballot is the key to the whole problem of the restoration of popular government in this country."

Theodore Roosevelt: "I believe in the short ballot. You cannot get good service from the public servant if you cannot see him, and there is no more effective way of hiding him than by mixing him up with a multitude of others so that they are none of them important enough to catch the eye of the average work-a-day citizen."

William H. Taft: "I have the fullest sympathy with every reform in governmental machinery which shall facilitate the expression of the popular will, such as the short ballot and the reduction in elective officers."

As further proof of the non-partisan character of the movement and its growth in favor, I may add that this year the short ballot principle was recommended by ten governors in their messages to the legislatures, and two years ago it was advocated by fourteen governors, including Governor Lister of Washington, Governor Withycombe of Oregon and Governor Alexander of Idaho.

In the State of Washington, in addition to the judiciary, we elect the governor, lieutenant-governor, secretary of state, treasurer, auditor, superintendent of education, attorney-general, commissioner of public lands, and commissioner of insurance—a total of nine elective officers that should be reduced to three—namely, the governor, a lieutenant-governor (to take the place of the governor in event of removal or disability of that official) and an auditor or comptroller to serve as a financial check on the administration. The other officials should be appointed by the governor, and the governor could then be held by the people to a strict and undodgable responsibility for all the official acts of himself and his appointees, precisely as the American people now hold their president to strict and undivided responsibility.

In this and other counties of Washington we elect three commissioners, sheriff, auditor, treasurer, prosecuting attorney, clerk, assessor, engineer, superintendent of schools and coroner. The state constitution should be so amended that each county would have the option of continuing this old system or adopting a reform plan of really responsible commission government, under which the people would elect the three commissioners and an auditor, empower the commissioners to appoint the other officials (excepting the judges) and hold them to undivided responsibility.

The fallacious objection has been raised to this reform that it would be "undemocratic," that it would deprive the people of their privilege of choosing all their officials. But the truth is, as pointed out by scores of political economists and others, that it is the old system that is undemocratic, since it paves the way for the formation of political machines and the domination of government by a few political bosses. It is significant that the bosses are opposed to short ballot reform, and they have their reasons. They know, far better than the people know, that under the present plan of multiplication of elective officials they can and do wield a power that would be taken from them under the short ballot.

I have put this question often to well informed voters: "Can you truthfully say that at any general election, when scores of candidates were on the official ballot, you were capable of voting an enitrely intelligent ballot?" And in every instance they have admitted, on reflection, that they never did; that, strive as they might to acquaint themselves with the records and capabilities of the various candidates, they always had to vote blindly and unsatisfactorily on a number of the offices to be filled.

I am speaking now of that class of voters that make more than the ordinary effort to advise themselves regarding the merits of the various candidates. Always they have to fall back on a measure of blind voting, of mere guesswork. What, then, must be the extent of this blind voting by the less informed electors? Here is where the professional politician finds and seizes his opportunity.

If any one in this convention hall has further doubt as to the truth of this statement he has only to make a few inquiries to clear his mind of all question. Let him ask any average voter, or even any exceptionally well informed voter, for whom he voted at the last election for such offices as secretary of state, auditor and commissioner of public lands; for whom he voted in his county for auditor, clerk, engineer or treasurer.

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*Address at the annual meeting of the Washington State Association of County Commissioners, Spokane, Wash., Sept. 6-8, 1917.

†Spokane, Wash.

I need not tell you gentlemen, who are serving in the various counties of this state in the capacity of county commissioners, that under this system of the long and confusing ballot the public has divided responsibility, which often means no responsibility, and costly conflict of authority, which means waste of public funds and impaired efficiency in the court house.

As a further refutation of the objection that short ballot reform would be undemocratic, we remind the objectors that the American people will be trying nothing new when they adopt that reform and establish real commission government in their counties. We have tried the principle of the short ballot in national government ever since the republic was founded, and would not think of changing it for the long ballot. We elect a president and a vice president. We do not elect the members of his cabinet, or the treasurer of the United States, or the United States marshals, attorneys and postmasters. We require the president to appoint his subordinates, and hold his administration to strict and undivided responsibility.

The short ballot and commission government are coming. The reform is inevitable, for it is right, sound and beneficial. And when it is adopted, and the people see the benefits of the change, they will no more return to the old tangle and jungle of the long ballot and divided and disputed responsibility than they would give up the Australian ballot, or the direct primary, or the commission government in cities that have tried it and found it good.

What Type of Road to Build in Kansas*

By W. S. GEARHART†

The types of road best adapted to Kansas conditions are receiving serious consideration in many sections of the state, and the county offical s and the big public-spirited road enthusiasts are attacking this problem in earnest.

Ten years ago motor vehicle traffic was scarcely a factor to be considered in the construction of roads, but in this short time it has completely upset all of the old practices. The motor truck now is in about the same stage of development as the pleasure car was ten years ago, except that the truck is a model of perfection as compared with the car then, and there will be none of the old prejudice to overcome. The motor truck has proven itself and has won its place on the public highway.

Recently the Iowa Highway Commission took a traffic census on eight different roads for a period of from seven to ten days each, and the count showed a total of 1,053 horse-drawn passenger vehicles as compared with a total of 19,706 motor passenger vehicles passing the stations during this time. The eight counting stations also showed a total of 770 motor trucks to 683 horse freight vehicles.

In a number of sections of the country today the farmers contract with the owners of motor trucks to haul their grain and other farm products to market because they can contract it cheaper than they can haul it themselves with horses or mules. In another ten years old Dobbin will have to stay home with the cows, for he will not be able to compete with the gas engine on the highway, either for business or pleasure.

It is now clearly evident that our highways will have to be designed to carry both freight and passenger motor vehicle traffic. The amount of this traffic, however, we can only guess; but there will be little excuse for building a type of road which will not economically carry the traffic.

Kansas has few paved roads, and in one respect she is fortunate, for she will not have to pay for a lot of worn-out highways. She can begin right at the bottom without any handicaps except an inadequate constitution.

When a comprehensive system of 100 to 200 mi. of main roads is to be improved in a county at one time the types can be selected on a reasonably scientific economical basis after a traffic census has been taken on the different roads and the population and the property valuation along each road are known. The cost of road service is the first cost, plus the maintenance cost, plus the interest on the money invested, divided by the number of users. Therefore if the type is properly adapted to the traffic the cost of service will be approximately the same on all types.

Every type of road has a value or ability to render service and a corresponding cost. For instance, if the average annual cost of an earth road, including first cost, the maintenance cost, and interest on the money invested, is $250 per year, and it carries an average traffic of 100 vehicles per day, then the cost to the county per user is $2.50 per year. Assuming that the average annual cost of a gravel road, including first cost, the maintenance cost, and interest on the money invested, is $750, and it carries an average traffic of 300 vehicles per day, the cost to the county per user is $2.50 per year. Assuming that the average annual cost of a concrete or brick road, including first cost, the maintenance cost, and interest on the money invested, is $1,500, and it carries an average traffic of 600 vehicles per day, then the cost to the county per user is again $2.50 per year.

When each road in a system has been properly designed one type is as good as another; that is, an earth road or gravel road in the right place is as good as a concrete or brick road where a concrete or brick road is required, and, on account of the difference in cost, a great deal better than a concrete or brick road where only an earth or gravel road is needed.

The type of road in each case should be selected as we would plan a sewer or tile drain system; that is, by using the size of tile or type of road surface required in each place to perform the function demanded of it. No one would consider using all 4-in. or all 16-in. tile in a drainage or sewer system, and for the same reason no one type of road should be selected for a whole system of roads unless each road in the system will probably carry approximately an equal amount of triffic.

Many economies can be effected by building a comprehensive system of roads at one time, and there would be the further advantage of getting the roads sooner and enjoying them longer, but unfortunately there has been little consideration of this method of road improvement in Kansas. The adoption of such a system would mean the improvement of about 10% of the roads in a county within a period of about five years.

When the piecemeal, one road at a time method is adopted for the improvement of a few main roads we have an entirely different problem, and it now seems that this system will be used to build the main through roads connecting the princapal cities and market centers in Kansas. As soon as these roads are completed they will be required to carry an enormous automobile and motor truck traffic, and the county that overlooks this fact and builds a type of road not suited to this heavy traffic is sure to have a sad, expensive experience.

When the average daily traffic does not exceed 100 to 200 ordinary vehicles per day no type of road can be more economically constructed and maintained than an earth road, and no other type of road responds to intelligent direction more quickly or more satisfactorily.

In order to economically maintain any type of road it is necessary to cut down the hills, fill up the low places, provide adequate drainage, protect the side ditches and build the bridges and culverts of concrete or stone. Regardless of the type of surface to be used, the road should be built to permanent grade, and permanent drainage structures, not only large enough to carry the water, but wide enough to safely carry the traffic, should be provided. These improvements are of the most permanent character, and should be made whether or not the road is to be surfaced immediately, for they will give the best possible earth road for the money invested, and such an earth road can be more economically maintained by continuous dragging than any other. An earth road that has been maintained for several years, as indicated above, would be in the very best condition to be paved with a hard surface, for it would be thoroughly settled. No better foundation could be made, and even though the road were not paved for several years after it had been built to permanent grade, not a dollar of tax money need be wasted. The building of an earth road to approved width and permanent grade, providing adequate drainage, protecting the side ditches, and building all necessary bridges and culverts (costing less than $2,000) of permanent materials are improvements of the most substantial character, and may be financed under the benefit district law. The life of the bonds, however, for such improvements should not ordinarily be more than ten years.

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*Address at the Kansas Free Fair, Topeka, Kan., on "Good Road Day," Sept. 12, 1917.

†State Highway Engineer of Kansas.

The ordinary rock roads, technically known as water bound macadam, and gravel roads were the types of surfaced highways used almost universally until the advent of the automobile. This new, fast, motor-driven traffic, when concentrated, caused the rapid disintegration and the wearing out of the rock roads. The disintegration under this traffic was so great that protective coats of asphalt, tar and other materials were necessary to hold the particles of stone together and seal the surface, but on account of the soft stone used in the construction and the lack of continuous efficient maintenance these protective coats have not been very satisfactory, and rock roads in general have come into bad repute in Kansas. This attitude toward the rock or macadam road will no doubt continue until the best materials and standard methods of construction are used and the patrol system of maintenance is adopted. Rock roads may possibly have to be confined to the highways of secondary importance on account of the soft stone available and the rapidly increasing heavy motor vehicle traffic.

A well built gravel road is probably the best cheap surfaced road that can be constructed in Kansas at this time, and with reasonable maintenance will economically carry an average daily traffic of from 250 to 350 vehicles. Practically every county in the state has deposits of gravel suitable for road purposes if properly used, but unfortunately this type of construction has received little or no consideration except in five or six counties. Most of the gravel obtained from the rivers and much of the pit gravel does not contain a sufficient amount of binder to hold the particles together when placed in a road. To such gravel from 15% to 25% of good binder clay should be added. The original cost of a gravel road 16 ft. wide will vary from $2,500 to $6,000 per mi, depending upon the distance the gravel must be hauled and the amount of grading to be done. The maintenance cost will amount to from $50 to $150 per mi. a year. This will be dependent upon the quality of gravel used and the volume of traffic the road carries.

The advantages of a gravel road are that local materials and local teams and labor can be used in the construction and maintenance and every dollar of tax money invested will stay right in that community, and the road can be maintained with a grader and a drag. Any holes that may form in the surface can be easily repaired by filling them with the same kind of gravel as was used in the original construction. The deposits of gravel in the different counties should be carefully investigated and this local material used to the fullest extent. When local gravel is available for road work it will relieve the railroad congestion. The life of the bonds used for gravel roads should ordinarily be limited to about ten years.

When the average traffic on a road exceeds 300 to 400 vehicles per day, or when there are reasonable grounds to believe that in a short time after the road is completed—as would be the case on a cross-state highway—it will carry a traffic exceeding this amount, Portland cement concrete or brick roads will generally be most economical when the first cost, interest on the investment, maintenance cost and the character of service rendered are considered. When prices are normal the cost of an 18-ft. concrete road in the eastern third of Kansas would be from about $12,000 to $16,000 per mi., but at the present time the cost would be from $15,000 to $20,000 per mi. The maintenance cost of a concrete road will be about $25 per mi. per year. This does not include the cost of maintaining the earth shoulders and side ditches nor the cutting of the weeds, but just the pavement proper.

A monolithic brick road will generally cost from 10% to 25% more than a concrete road, and the maintenance cost of the pavement proper will be about $15 per mi. per year.

Experience to date indicates that it is reasonable to assume that the life of either a concrete or brick road will be from twenty to thirty years, and that twenty-year bonds can be safely used for such improvements.

To assure success in the building of concrete or brick roads first-class materials and the very best methods of construction must be used, and such work should not be undertaken except under the direction of thoroughly competent engineers.

Fortunately, Kansas has a large number of cement and brick plants which are turning out first-grade products, an abundance of good sand and a reasonable amount of gravel and limestone suitable for the types of construction mentioned.

Nature has provided the materials and the Legislature has enacted the necessary laws, and now it is up to the people to finance the roads, either by county bond issues or the benefit district plan, if they want to pull Kansas out of the mud.

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The Elimination of Grade Crossings in Western Pennsylvania is receiving the attention of the Public Service Commission of that state.

The State of Iowa is supplying road and bridge engineers to the government for military service, to such an extent as to make serious inroads upon the force, according to the "Service Bulletin" of the Iowa Highway Commission.

North Cove Township in McDowell County, North Carolina, will improve 20 mi. of highway paralleling the Carolina, Clinchfield & Ohio Railroad from the Marion Township line to a point near Spruce Pine in Mitchell County, where it will join the highway which runs by way of Elizabethton to Johnson City, Tenn.

Prospective Routes of the Washington-Atlanta Division of the Bankhead National Highway are to be inspected by a party consisting of Senator Bankhead and other congressmen interested in the promotion of this highway as a military road on account of the number of cantonments along its route. The party expects to leave Washington, D. C., by automobile about Nov. 1.

A Highway from Port Limon to Toro Amarillo, Costa Rica, a distance of 61 mi., is to be constructed pursuant to a law passed by the republic, according to a recent "Commerce Report." It is stated that although the building of this highway may be delayed for some time, perhaps for years, plans are being made to construct the road as far as Moin, about 4 mi. The road is to be of common dirt, with wooden bridges.

Highway Problems in New York State.—I.*

BY H. ELTINGE BREED†

The title implies that there are problems in the planning and construction of highways, more problems, I think, than the average individual realizes. They are so many and varied that I am not going to inflict them all upon your good nature. Instead I will try to present those that most perplex us now, with some suggestions of their antecedents.

Prior to 1898 no appropriations had been made by the State of New York for state aid in the improvement, construction, maintenance or repair of its public highways which aggregate in length approximately 80,000 mi. At intervals from as far back as 1825 and 1826, when Governor Clinton advocated the construction of a state road connecting the Great Lakes with the Hudson River, the subject was discussed, but generally in a more or less academic manner. Eventually the necessity for improved methods of travel resulted in the formation of large numbers of toll road companies and the construction of a large number of toll roads under private control. And in this connection it is interesting to note that reports made in connection with some of these roads showed that farm lands contiguous to plank roads increased in value from 20 to 25%; that timber lands opened up by means of the roads increased in value from 50 ct. to $3 per acre, and that the business of the villages and cities in the vicinity of the toll roads was stimulated and their prosperity materially increased.

From 1890 to 1900 the value of farm lands and buildings in New York State decreased from $968,000,000 to $888,000,000, a total decrease of $80,000,000.

The experience of Massachusetts showed that farm lands contiguous to the improved roads increased in value from $10 to $30 per acre.

The main reason set forth for the appropriation for the improvement of public highways in New York was that the increase in the value of farm lands would increase the taxable assets in the rural districts to a large amount and that it would also materially benefit the City of New York, as tending to equalize the burden of taxation throughout the entire state. This argument seems to have been well founded, as the last United States census shows that the value of farm lands from 1900 to 1910 in the State of New York increased in value to the amount of $381,700,000.

The first appropriations for highways were wisely spent in so far as they were scattered over the entire state, so that all the people came to know their advantages. It has, therefore, been easy to raise the subsequent appropriations by the two referendums for fifty millions each, with which you are all familiar.

The demand for improved roads by the farmers was half-hearted because of the general feeling that there would be a large increase in taxes, for which the large majority of them did not want to be obligated. However, the bicycle riders, who had formed themselves into the League of American Wheelmen, were able to organize and conduct a campaign of such vigor that the necessity for an improved system of highways was urgently brought to the attention of the public in a manner which the farmers throughout the state had been unable to attain. With the growing demands of this organization and of some of the agricultural organizations and with the growing demands of cities, villages and rural districts, the importance of this subject soon took on state-wide significance.

The League of American Wheelmen were just as insistent in those days and just as influential as the automobile organizations have since become and were in a large measure responsible for the appropriation of moneys and the first legislation which projected what is our improved highway system of today.

The first appropriation by the state was made under the Fuller-Plank Act. This was passed by the Legislature in 1898 and provided that every town which raised its highway tax in cash instead of working out its tax would receive a sum of money equal to the amount thus raised, these moneys to be expended by the town officials. This general principle is still in force, the state now contributing approximately $2,000,000 annually for this purpose. The highways built by these moneys are designated as town highways and are those highways not included in the system of state and county highways hereafter referred to.

In the year 1898 the Legislature also passed what is known as the Higbie-Armstrong Act, relating to county highways. In general, it provided that the state engineer, upon being duly petitioned by the board of supervisors, be authorized to improve the highway petitioned for, the state paying 50% of the cost, the county 35% and the town 15%; $50,000 was appropriated as the state's share for this improvement in 1898. The act became effective March 24, 1898, and during that year contracts were awarded for the improvement of four roads. In 1899 another appropriation of $50,000 was made, and in 1900 $150,000 was appropriated.

During this time the demands of the various counties became so insistent that a convention was held in February, 1901, and notice sent to the boards of supervisors throughout the state. This convention was continued annually until about 1908. Among the many prominent persons who attended these conventions was Mr. Shattuck, of New York City, President of the Automobile Association of America. From this time the motorists took a decided interest in the improvement of public roads. The effort of these conventions was to obtain increasing annual appropriations.

At these conventions great attention was given to the distribution of the cost of the roads between the cities, villages and rural districts, but no thought was given to any expenditure for the improvement of city or village streets. As $100,000,000 was to be spent for a barge canal which was conceded to be mainly for the benefit of Buffalo and New York City, it was argued that if the rural districts were to pay a part of the cost of the canal, the cities should at the same time be willing to pay a similar proportion of the cost of improved highways, which would be not only a benefit to the residents of the rural parts of the state but would also materially develop the resources of the cities.

The demand for improved roads was so greatly in excess of the annual appropriations that were being made that it was necessary to provide for larger appropriations without increasing the annual budget. It was suggested by the state engineer in his report of 1901 that a bond issue of $10,000,000 should be made. This was considered at the convention of 1901 and thoroughly discussed at subsequent conventions until there was adopted an amendment to the constitution on November 7, 1905, which became effective January 1, 1906. This amendment authorized a bond issue not to exceed $50,000,000, the proceeds to be used for the improvement of highways under the general laws. It also provided for equitable apportionment among the counties.

For several years preceding the adoption of this amendment and its final ratification by the people at a general election, the building of public roads was each year receiving more attention. The annual appropriation in 1904 was $1,108,000. This work was done by the state engineer under the Higbie-Armstrong Act.

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*Part of a paper read before the Albany Society of Engineers, Albany, N. Y., April 24, 1917. The remainder of the paper will appear in later issues.

†First Deputy Commissioner of Highways, New York.

Both the cities and villages were excluded from participation by the Higbie-Armstrong Act, and not one dollar had been spent by them. The roads to be improved under this act were those for which the boards of supervisors had petitioned, the only exception being that the state engineer was authorized to improve a road of not more than 1 mi., without petition, if, in his opinion, it was necessary to form a connecting link.

In 1906 the highway law was amended so as to permit of the construction of a connecting highway through an incorporated village where deemed advantageous by the state engineer. In this year the Legislature appropriated $5,000,000 of the first $50,000,000 bond issue. In 1907 an appropriation of $3,000,000 was made, and in 1908 another appropriation of $3,000,000.

In the expenditure of the moneys from the bond issue, some of the limitations of the Higbie-Armstrong law were brought to light. In 1906 an act was passed directing the state engineer in conjunction with the boards of supervisors to prepare a map on which should be designated the county highways in each county that were supposed to constitute the main market roads of that county and as such to be eligible for improvement by state aid. This map was approved by the Legislature in 1907. It was based on the theory that one-tenth of the state's total mileage, or 8,300 mi., would cover the main market roads and when entirely completed extend from county seat to county seat and form continuous highways across the state. This apportionment was carried out in that each county was to have about one-tenth of its total mileage designated for improvement.

This legislation culminated in 1907 in the appointment of a committee to investigate the subject of highways. It presented to the Legislature of 1908 a proposed highway law which repealed the two earlier acts and nearly every law referring to highways which had ever been enacted in the state. The new law provided for four general propositions:

First, the improvement of the system of state highways, aggregating 3,600 mi., to be built at the expense of the state.

Second, the improvement by state aid of the so-called county highways designated on the map referred to, the cost to be borne by the state, county and town.

Third, the construction, improvement and repair of town highways.

Fourth, the repair and maintenance of state and county highways after their construction.

The law also provided for the establishment of a commission of highways to carry out the provisions of the law. This act became effective January 1, 1909, and about February 1 of that year the Highway Department was organized to take over this work which had previously been carried on by the state engineer.

The new law provided in a more definite manner for the handling of connecting links both on state and county highways, and subsequently connecting links were authorized through cities.

The Highway Commission, on organization, saw that the available money from the bond issue would not be sufficient to complete both the state and county systems, and, as the law provided that not more than one-half of each annual appropriation should be used for state highways, the commission ruled that the basis of division for each annual appropriation should be one-half for state highways and one-half as the state's share for county highways. Then each county was allotted out of the annual appropriation such an amount for state highways as the proportion of state highways allotted to that county bore to the total mileage of state highways throughout the state, modified, of course, by the total mileage of state highways which it was estimated could ultimately be built. The same method was adopted for the distribution of moneys for county highways.

In 1911 the Legislature passed a number of acts making specific appropriations from the $50,000,000 bond issue for the express purpose of building specified routes, thereafter known as "expedited routes." These appropriations aggregated $14,000,000 and directed the immediate improvement of these routes without regard to any equitable distribution of the money or the mileage as between the counties. This, of course, left it impossible to distribute the entire $50,000,000 equitably among the different counties.

The legislation for the "expedited routes" had its inception in the fact that the Legislature really acted upon the urgent solicitation and insistence of the automobile associations of the state and provided for the immediate improvement of the state route from New York to Albany and from Albany to Buffalo for the purpose of completing the connections between the macadam roads already built. This law, however, provided that no county which participated in the moneys for the "expedited routes" should receive any further annual moneys until such time as the counties which did not participate should have received such an amount of improvement as would equalize the mileage, so as to adhere to the principle of equitable distribution.

One of the ideas in expediting these routes was that the larger cities which paid a large proportion of the cost of the work should have the benefits of a through route.

The apportionment and the expenditure of the first fifty millions emphasized the fact that there would be a large amount of desirable mileage that would be uncompleted when these funds had been expended. It also showed that many counties containing cities received much less than their equitable share and because of the fact that the people had had a taste of good roads, knew what they were, saw their usefulness in the development of the state's resources and were hungry for more, the project for the second fifty millions was promulgated, and the Legislature of 1912 adopted a referendum which was voted upon at the general election of that year and carried, the money to be apportioned equitably among the counties containing towns. Twenty million of this new bond issue was to be used for state highways and thirty million for county highways. The apportionment of these moneys was to be made on the basis established by this referendum for its state routes, which had been laid down by the highway law at the time of the adoption of the referendum and for those county highways designated on the map approved in 1907, allowing the modification of such map by the boards of supervisors providing the total mileage in any one county was not increased by such change.

I have outlined this rather fully, because, while you may all have known of the way the money has come, still at this time you may have lost sight of some of the essential facts in the provision of the funds with which we are improving our public highways.

Uniform Grading Methods on Missouri Roads

Typical plans and specifications for the establishment of a uniform system of grading on earth roads have been issued by the Missouri State Highway Department, in accordance with a requirement of the new law of the state. Instructions as to radius of curvature for state roads and approved methods of hard surfacing are included.

The specifications recommend that wherever possible earth roads be graded 30 ft. between ditches, with a 24-ft. traffic-way, and a crown not to exceed ¾ in. to the foot. A narrower road, which will be approved in rugged sections, is 24 ft. between ditches, with a 20-ft. traffic-way. A slope of 3 in. to the foot into the ditches is recommended.

The department calls attention to frequent complaints from different sections that the roads are graded too high in the center for safe travel, and urges road overseers to follow instructions given and grade the roads with a low crown, providing proper drainage from the side ditches.

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

OCTOBER 6, 1917

WHAT TYPE OF ROAD TO BUILD

Too much emphasis on the need for the intelligent selection of pavement types is impossible. For that reason we revert here to a subject that has been discussed very frequently in these columns, the last previous reference appearing only a few weeks ago.

There is printed in this issue, under the title "What Type of Road to Build in Kansas," an address by State Highway Engineer Gearhart of that state, in which the principles of pavement selection are set forth with a force and clarity that make the address well worth reading. Although the discussion refers primarily to Kansas, the general facts so clearly stated are equally applicable to any other section of the country.

Particular attention is directed to the statement of the relation between cost and service rendered. The latter factor is quite frequently left out of consideration, yet in choosing the kind of road surface it should have quite as much influence as some other factors.

Country roads, city streets, railroads, street car lines, horse-drawn vehicles, pleasure cars and motor trucks, freight cars and Pullmans are all means to an end, the end being the transportation of passengers or freight. Each one of these has a certain cost and gives certain service and in the case of each of them the cost should be as low as possible for the service rendered. No railroad company would build a six-track line, with 120-lb. rails and the most approved block signal system, to take care of one mixed train daily from a small shipping point to a junction with its main line. For exactly the same reasons, no county would be justified in building a high priced pavement 20. ft. wide to accommodate the traffic from four or five small farms to a market center or shipping point. In neither case would the service rendered justify the expense incurred.

The planning of any road system—whether it be for a township, a county, a state, or a nation—will not be well done unless due regard is had for this first principle, the balancing of cost and service. In any given case different roads will require different treatment. The present and expected traffic on some roads will justify the laying of the most costly types of pavement; that on others less expensive surfacings; that on still others may call for nothing more than proper drainage and careful maintenance.

There is no "best" pavement for Kansas or for Connecticut, nor for any other state. There is one best pavement for any given section of road and that pavement can be chosen by the exercise of engineering and business sense—and in no other way.

REGULATING PEDESTRIANS

The enactment of a law providing for the regulation of pedestrian traffic is advocated by the Safety First Society of New York, which proposes to have a suitable bill introduced at the next session of the New York Legislature.

Motorists will undoubtedly welcome such action and it should be possible to count upon their support of the measure. In addition, everyone who has studied the traffic problem in the more populous cities will probably favor some such law, and it is to be hoped that too strenuous opposition will not be manifested by pedestrians, for such a law would be quite as much to their benefit as to that of anyone else.

The enormous increase in total traffic and the changes in the character of vehicles using the highways that have come in the past few years have made the regulation of vehicular traffic a necessity. From a matter receiving little or no attention it has grown to a problem of such magnitude and complexity as to tax the abilities of legislators and police officials. Much study has been given to the question and elaborate laws and regulations have been provided to meet existing conditions.

In all traffic regulations, whether by statute or police control, two chief ends are sought—the safeguarding of life and limb and the facilitating of traffic movements. The matter is complicated by the necessity of the common use of streets and roads by very different kinds of vehicles, and by pedestrians. Efforts to safeguard all users of the highways have always been handicapped by the failure to include the latter in the classes regulated.

If it is just and fair to stipulate the manner in which motor-driven and horse-drawn vehicles shall be used on the public thoroughfares—as it certainly is—it is equally within the province of the police authority to lay down rules and regulations for the conduct of pedestrians on the roads and streets. There can be, therefore, no ground of complaint from the foot traveler of unjustice, especially in view of the fact that the restrictions on vehicular traffic are placed there primarily for his protection.

It is to be hoped that the Safety First Society will present a wise, carefully drawn bill, and that it will be accorded due consideration by the Legislature and put on the statute books without delay.

CALL FOR VOLUNTEER ROAD BUILDERS TO GO TO FRANCE

Under the caption "Road Builders Wanted for Service in France," attention was directed in "Good Roads" of Sept. 15, to the call of the United States Government for skilled engineers and other road builders to go to France as a unit of the National Army.

In the same issue we called attention editorially to the needs of the government and gave as much detail in regard to the plan as was then available. As stated in that issue, of the five engineer regiments being organized as a part of the National Army, the 23rd Engineers is designated as a highway unit and will have a strength of some 10,500 men.

Col. E. N. Johnston is in command of the 23rd Engineers. Majors I. C. Moller and H. H. Stickney will command the first two battalions.

The call for volunteers includes engineers, contractors, and in fact every class of labor connected with road building excepting pick and shovel men. The common labor is to be done by prisoners of war.

The need for road building volunteers is urgent, and it should not be difficult to raise the necessary number required for the regiment without in any way seriously affecting road building in the United States.

Further information can be secured by addressing Col. E. N. Johnston, 23rd Engineers, National Army, 1419 F St., Washington, D. C.

Suspended Span of Quebec Bridge Raised.

The new central span of the cantilever bridge over the St. Lawrence River at Quebec, Can., was finally hoisted to position on the afternoon of Sept. 20. The span has a length of 640 ft., is 88 ft. wide, and will weigh when floor, tracks, et cetera are laid, about 5,600 tons. It was built at Sillery Cove and was floated by means of scows 3½ mi. to the main bridge site where a lift of 150 ft. was necessary to place it in its present position.

This suspended span holds the world's record for length, being 90 ft. longer than that of the Forth Bridge at Edinburgh, Scotland.

An attempt in September, 1916, to hoist a center span of which the present one is a duplicate, for the Quebec Bridge resulted in disaster, the loss of a number of lives and many thousands of dollars. On a previous occasion, in 1907, the southern portion of the bridge collapsed. The loss was estimated at about $8,000,000.

The Quebec Bridge has a total length from shore to shore of 3,239 ft. It is located 6 mi. from Quebec. It carries 2 railroad tracks, two street car tracks, and two highways. It was built by the St. Lawrence Bridge Co., of Montreal, Can.

Work on the Dixie Highway in Kentucky and Tennessee.

The rapidity with which the construction of certain portions of road through the mountains of Kentucky and Tennessee is carried forward will determine the completion of the Dixie Highway between Cincinnati, Ohio, and Chattanooga, Tenn. A motor trip through the Cumberlands now represents the severest test of endurance of car and occupants, but the work now under way and the efforts being made to secure the improvement of other portions of the route give assurance of a well improved highway throughout the distance within the coming year, according to a recent statement by the Dixie Highway Association.

One of the unimproved connecting links now receiving attention lies between the Rockcastle River and Livingston in Rockcastle County, Kentucky. This is 4½ mi. long. After fording or ferrying the Rockcastle River, it is now necessary to travel the Gauley Mountain trail for 5 mi. The new road will follow the river, avoiding both the Gauley and Wild Cat Mountain crossings. A fund of $50,000, to be used with a like amount set aside by the state, is being raised for the building of this road. To date, $26,000 of it has been received. Part of the grading has been completed between Livingston and Mount Vernon and the surfacing of the road is being started. All but a mile of the grading between Mount Vernon and the Madison County line has been finished. This, with the immediate grading and surfacing of 3½ mi. over Scaffold Cane Hill, will connect at Berea, in Madison County, with excellent macadam or gravel roads into Cincinnati.

Southward from Livingston through Laurel, Knox and Bell Counties, Kentucky, the work is progressing. In Laurel County there are 7 mi. of new grade extending from the Rockcastle River toward London, which it is proposed to surface, using money from the $100,000 fund now being raised. This will extend to within 2 mi. of the end of the 1 mi. of improved road leading into London. From London to Corbin there are 2 mi. of light construction under way, for which warrants amounting to $25,000 have been voted, and 6 mi. of macadam road built on an abandoned railroad grade.

Knox County has over 85% of the grading of 26 mi. finished and has awarded the contract to four firms to complete the grading and surfacing. The county has ample funds for the work. The new grade through the mountains —a state aid project—is an excellent example of a high type of mountain road construction.

With 3 mi. of surfacing to be completed in Bell County, an improved road will be provided through Pineville to the Tennessee state line.

In Claiborne County, Tennessee, 3 mi. of grading and 7 mi. of surfacing are to be completed. The contractor at work on the remaining 4 mi. in Union County is under bond to finish both grading and surfacing by Dec. 15. This will complete the improvement of the route to Knoxville.

A keen competition exists among rival communities for the routing of the highway. The type of grading and surfacing, particularly in the Kentucky counties, testifies to the value of state aid and state inspection.

Highway Progress in Wyoming

Substantial progress has been made in highway development in the State of Wyoming since the organization of the new State Highway Commission early this year. Advices received from Z. E. Sevison, State Highway Engineer, covering operations up to practically Oct. 1, state that a system of state highways having a total mileage of about 3,400 has been designated by the Commission. This system includes the Lincoln Highway, the Yellowstone Highway, the Black and Yellow Trail, and a large mileage of post roads for improvement under the federal aid act.

Twelve federal aid projects have been submitted to the Secretary of Agriculture, and it is believed that a majority of these will be approved at an early date. Surveys on all of these projects have been completed, also on four additional projects, which are to be submitted at once.

Owing to unavoidable delays in getting the federal aid projects advanced to the point where construction can be started, the State Highway Commission has recently apportioned all available state highway funds to the various counties and has authorized State Highway Engineer Sevison to immediately proceed with road and bridge construction wherever surveys and plans have been made or can be made in time to permit of construction being started this season. Under this program actual construction has been started in five counties of the state, and it is expected that work on six more state aid projects will be commenced immediately.

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Mingo County, West Virginia, has passed a bond issue of $1,000,000 for road betterment.

The Minnesota State Highway Commission's Exhibit at the State Fair presented the various stages of road building in the state from the days of the pioneer to the present time. Various types of surfacing and advantages of modern road and bridge construction were displayed by models.

Citizens of Charleston County, South Carolina, will vote on proposed bond issue of $275,000 at an election to be held Oct. 10. The proceeds are required for permanent highway improvement. If issued, the bonds will be in denominations of $1,000 each, bearing interest at the rate of 4½%, payable semi-annually, and will mature in fifteen years.

Ohio Road Work to be Placed Under Contract.

State Highway Commissioner, Clinton Cowen, will receive at the office of the Commission, Columbus, Ohio, on Oct. 12, proposals for road work in a number of counties of the state. The location of the roads to be improved, the estimated cost, and other data are given in the following paragraphs. All work is for grading, the construction of bridges and culverts, and paving, unless otherwise specified:

Ashland County: Hanover Township, Sec. A, Columbus-Wooster Road, length, 8,142.5 ft., width, 10 ft.; monolithic brick, $44,170.50. Clear Creek Township, Sec. A, Ashland-Norwalk Road; length, 24,930 ft., width, 10 ft.; monolithic brick on concrete base, $110,597.98. Clear Creek and Ruggles Townships, Sec. G, Savannah-Vermilion Road; length, 21,572 ft., width, 10 ft.; monolithic brick, $84,646.20.

Clermont County: Goshen Township, Sec. K-1, Cincinnati-Chillicothe Road; length, 10,755 ft., width, 14 ft.; water bound macadam, $19,403.72. Stonelick Township, Sec. N-1, Milford-Hillsboro Road; length, 5,168 ft., width, 14 ft.; water bound macadam, $11,398.92.

Darke County: Neave, Greenville and Van Buren Townships, Sec. A-1, Dayton-Greenville Road; length, 13,900 ft., width, 16 ft.; concrete, $66,180.50.

Highland County: Liberty Township, Sec. K, Hillsboro-Piketon Road; length, 12,700 ft., width, 14 ft.; bituminous macadam, $22,729.84.

Huron County: Lyme Township, Sec. L, Bellevue-Norwalk Road; length, 8,900 ft., width, 16 ft.; monolithic brick, $42,618.00.

Knox County: Monroe Township, Sec. K, Columbus-Wooster Road; length, 8,500 ft., width, 16 ft.; reinforced concrete, $49,093.68.

Lucas County: Waterville Township, Sec. J, Toledo-Napoleon Road; length, 23,700 ft., width, 16 and 18 ft.; grading and paving, concrete and 2-course water bound macadam, $73,334.15. Waterville and Monclove Townships; length, 19,700 ft., width, 18 ft.; concrete, $85,801.50.

Mahoning County: Poland Township, Sec. "b", Youngstown-Lowellville Road; length, 7,894 ft., width, 16 and 24 ft.; grading and paving, brick, $53,791.80. Poland Township, Sec. Y, Canfield-Poland Road; length, 9,943.7 ft., width, 14 ft.; water bound macadam, $23,088.05.

Morgan County: Penn Township, Sec. H. McConnellsville-Athens Road; length, 11,350 ft., width, 14 and 20 ft.; grading, constructing drainage structures, paving; brick and water bound macadam, $46,552.74.

Seneca County: Loudon Township, Sec. A, Tiffin-Fostoria Road; length, 8,178 ft., width, 16 ft.; grading, drainage structures, paving; brick, $44,400.59; bituminous concrete (A-2-a), $39,005.15; or bituminous concrete (A-2-c), $40,448.75.

Stark County: Osnaburg Township, Sec. B-2, Canton-New Franklin Road; length, 6,200 ft., width, 16 ft.; brick, $44,483.10.

Summit County: Springfield Township, Sec. R, Akron-Canton Road; length, 11,000 ft., width, 16 ft.; brick, $64,501.07. Norton and Franklin Townships, Sec. N-1, Cleveland-Massillon Road; length, 9,479 ft., width, 16 and 30 ft.; brick, $57,854.60.

Wayne County: Contract No. 1—Wooster Township, Sec. Q, Wooster-Canal Dover Road; length, 6,187 ft., width, 10 ft.; monolithic brick on concrete foundation, $23,823.41. Contract No. 2—Wooster Township, Sec. A, Wooster-Millersburg Road; length, 4,614.5 ft., width, 10 ft.; monolithic brick on concrete foundation, $16,074.15. Baughman, East Union, Sugar Creek and Green Townships, Sec. A, Orrville-Southern Road; length, 12,418 ft., width, 10 ft.; monolithic brick on concrete base, $53,121.88; or, width, 16 ft., bituminous macadam, $48,684.88; or, width, 16 ft., bituminous concrete on concrete foundation, $61,971.34.

Williams County: Madison Township, Sec. L, Bryan-Pioneer Road; length, 20,101.7 ft., width, 16 ft.; water bound macadam, $57,845.90; bituminous macadam, Sec. 6.1, $69,260.40; or bituminous macadam, Sec. 6.9, $66,763.48.

Jefferson County: Cross Creek Township, Sec. N-2, Steubenville-Cambridge Road, length, 9,640 ft., width, 18 ft.; maintenance and repair, grading and paving; resurfacing with brick on concrete foundation, $71,919.00, or brick on rolled base, $65,835.00.

Good Roads Day in Kentucky

A proclamation naming Sunday, Oct. 14, as "Good Roads Day" in Kentucky, and requesting ministers and other public men to join in impressing upon the people the need of better roads, has been issued by the governor of the state.

Attention is called to the fact that as the "construction and maintenance of public highways are necessary alike to our domestic prosperity and national defense, it is of prime importance that popular attention be called to the wisdom of a concerted and organized effort to extend our system of public roads and to preserve them by capable and scientific management."

Flying Squadrons for Completing Roads in Pennsylvania

In order to close up work now under way before the weather breaks, it has been decided by the state highway officials of Pennsylvania to form flying squadrons of laborers and move them from point to point. This decision was reached at a recent conference which was attended by the engineering staff of the state highway department, including fifteen assistant engineers. Instructions were given to each engineer to investigate and report upon the advisability of the state opening up stone quarries in various sections.

The advisability of working prison labor was also discussed in connection with general conditions due to the high cost of material and the scarcity of labor, but no definite action was taken.

Roadside Tree Planting on Fall Arbor Day in Pennsylvania.

The planting of trees along the highways of Pennsylvania in connection with the observance of Fall Arbor Day, which occurs Fri., Oct. 26, is recommended by State Highway Commissioner O'Neil. Instructions have been sent to the engineers and superintendents of the various counties to endeavor to interest residents along the state highways in roadside tree planting.

Fruit trees are recommended for the purpose, with special reference to the oxheart cherry tree, which is ornamental and will furnish both shade and fruit. It also grows to a large size, but its foliage is not so dense as to prevent the sun from drying muddy roads.

The sugar maple and red oak are suggested for purely shade trees, no tree to be planted more than one foot outside of the fence line, so that it may not be necessary to destroy any trees when, eventually, the roads, and especially the curbs, are built wider.

Commissioner O'Neil believes there are wonderful possibilities in roadside tree planting in Pennsylvania, and states that "too many of our main roads are shadeless 'ribbons' of heat during the summer months." He believes that if the district schools along the main roads would take up tree planting a great deal could be accomplished within a short period of years toward the comfort and beautification of the highways.

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Stone Cube Paving Is Being Used in Dayton, Ohio, to prevent slipping, on a 7% grade on Grafton Ave., which on portions not exceeding a grade of 1% is paved with wood-block. The cubes of 3½ in. are placed on a 1¼-in. sand cushion resting upon a 6-in. concrete base, and grouted with 1:1 cement. The stone paving costs $3.75 per sq. yd.

MEETINGS

Calendar of Coming Meetings

Oct. 9-12.—League of Kansas Municipalities.—Annual convention, Wichita, Kan. Secretary, C. H. Talbot, University of Kansas, Lawrence, Kan.

Oct. 16-19.—Southern Appalachian Good Roads Association.—Ninth annual convention, Nashville, Tenn. President, Henry Robert, Bristol, Va.

Oct. 17-18.—League of Minnesota Municipalities.—Fifth annual convention, St. Cloud, Minn. Secretary-Treasurer, Richard R. Price, University of Minnesota, Minneapolis.

Oct. 29-30.—Oklahoma Society of Engineers.—Annual convention, Oklahoma City, Okla. Secretary-Treasurer, H. V. Hinckley, Oklahoma City, Okla.

Nov. 19-24.—City Managers' Association.—Annual meeting, Detroit, Mich. Secretary, W. L. Miller, City Manager, St. Augustine, Fla.

Nov. 21-24.—National Municipal League.—Twenty-third annual meeting, Hotel Statler, Detroit, Mich. Secretary, Clinton R. Woodruff, 703 North American Building, Philadelphia, Pa.

Dec. 4-6.—American Association of State Highway Officials.—Annual meeting, Hotel Jefferson, Richmond, Va. Acting Secretary, H. M. Berry, Chapel Hill, N. C.

Jan. 15-17, 1918.—Virginia Good Roads Association.—Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

Southern Commercial Congress

The ninth annual convention of the Southern Commercial Congress will be held at the Hotel Astor, New York City, Oct. 15-17, 1917.

The congress will be devoted to the consideration of questions relating to the industries, commerce, municipal efficiency, manufactures and foreign trade, to problems resulting from the entrance of the United States into the war, and to other subjects.

Some of the sessions will be devoted to the discussion of road problems and these will probably take place on Tuesday and Wednesday, the 16th and 17th, respectively. Wm. F. McCombs, former Democratic national chairman, is Chairman of the New York Committee on Good Roads.

The headquarters of the New York General Committee are at the Hotel McAlpin, Broadway and 34th St. Oscar S. Straus is General Chairman, and Clarence J. Owens, General Secretary. Mr. Owens is also Managing Director of the congress.

Highway Officials at Detroit, Michigan.

A meeting was held at the Detroit Board of Commerce last week for the purpose of discussing auxiliary means of shipping war products in the event of possible railway car shortage. A detailed plan was outlined for assembling supplies at industrial centers and conveying them by motor truck to port terminals.

The United States Army Engineering Corps, the United States Office of Public Roads and Rural Engineering, and the state highway departments of Michigan, Indiana, Ohio Pennsylvania, New York and Virginia were represented at the meeting. Others present included A. A. Templeton, President, Detroit Board of Commerce; William E. Metzger, Chairman of the Good Roads Committee of the Board; R. D. Chapin, Chairman, Good Roads Committee, National Automobile Chamber of Commerce, and R. C. Hargreaves, who is at present associated with a committee of the Council of National Defense.

Citizens' Street Traffic Committee of Greater New York

At a recent meeting of the Executive Committee of the Citizens' Street Traffic Committee of Greater New York it was decided to hold the annual meeting of the organization at the Automobile Club of America, Wednesday, Oct. 10, at 7 p. m. It was also decided to make the meeting the occasion of a dinner. Among the questions to be discussed will be that of changing the name of the Committee to the "Street Traffic Association of New York State," or some other name comprehending a larger scope of activity.

In an address before the recent annual meeting of the Maine State Board of Trade, Charles F. Flagg, President of that organization, stated that one of its chief activities was to assist in the movement for good roads.

PERSONAL NOTES

J. T. Gear has been appointed City Engineer of Puyallup, Wash.

S. B. Taylor, of Dallas, Ore., is building a 30-mi. logging road for the Pelican Bay Lumber Co., of Klamath Falls, Ore.

Morgan T. Gum, former County Road Engineer of Sussex County, Delaware, has been appointed to a position in the State Highway Department.

J. N. Gladding, former City Engineer of El Paso, Texas, is now a captain in the Engineers' Reserve Corps, and is stationed at Fort Leavenworth.

Wm. E. Hawkins has been appointed Road Engineer of Sussex County, Del., succeeding Morgan T. Gum, who is now connected with the State Highway Department.

Howe & Wise, Consulting Engineers, of Houston, Texas, will act in an advisory capacity for Harris County in the expenditure of $1,100,100 recently raised by bond issue for highway improvement.

R. G. Carraway, for the past two years District Engineer in the Dallas, Texas, office of Henry E. Elrod, has been commissioned as a first lieutenant in the Engineers' Reserve Corps, Fort Leavenworth.

F. R. Goodman has resigned as Division Engineer of the State Highway Department of Arizona, and has accepted the position of County Engineer of Coconino County, with headquarters at Flagstaff, Ariz. He is an Associate Member of the American Society of Civil Engineers.

O. L. Gearhart, who was recently engaged in the improvement of earth roads in Stark County, Illinois, is now Resident Engineer for the Department of Public Works and Buildings, Division of Highways, on the construction of several miles of concrete pavement in Bureau County.

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Highway Problems in New York State—II[*]

BY H. ELTINGE BREED[†]

When you come to the actual building of roads you are beset by the obstacles that have troubled all road builders since the days of King Cheops. For ten years he had 100,000 men at work to build the great highway of ancient Egypt, and the floods of the River Nile constantly impeded their efforts.

The growth of cities and increase of traffic along the road built from Babylon to Memphis led to complaints of the dust nuisance in 2000 B. C.

The Romans with all their engineering skill were sorely put to it to find a foundation that would sustain the heavy army traffic over their roads, and only partially succeeded through the use of slave labor.

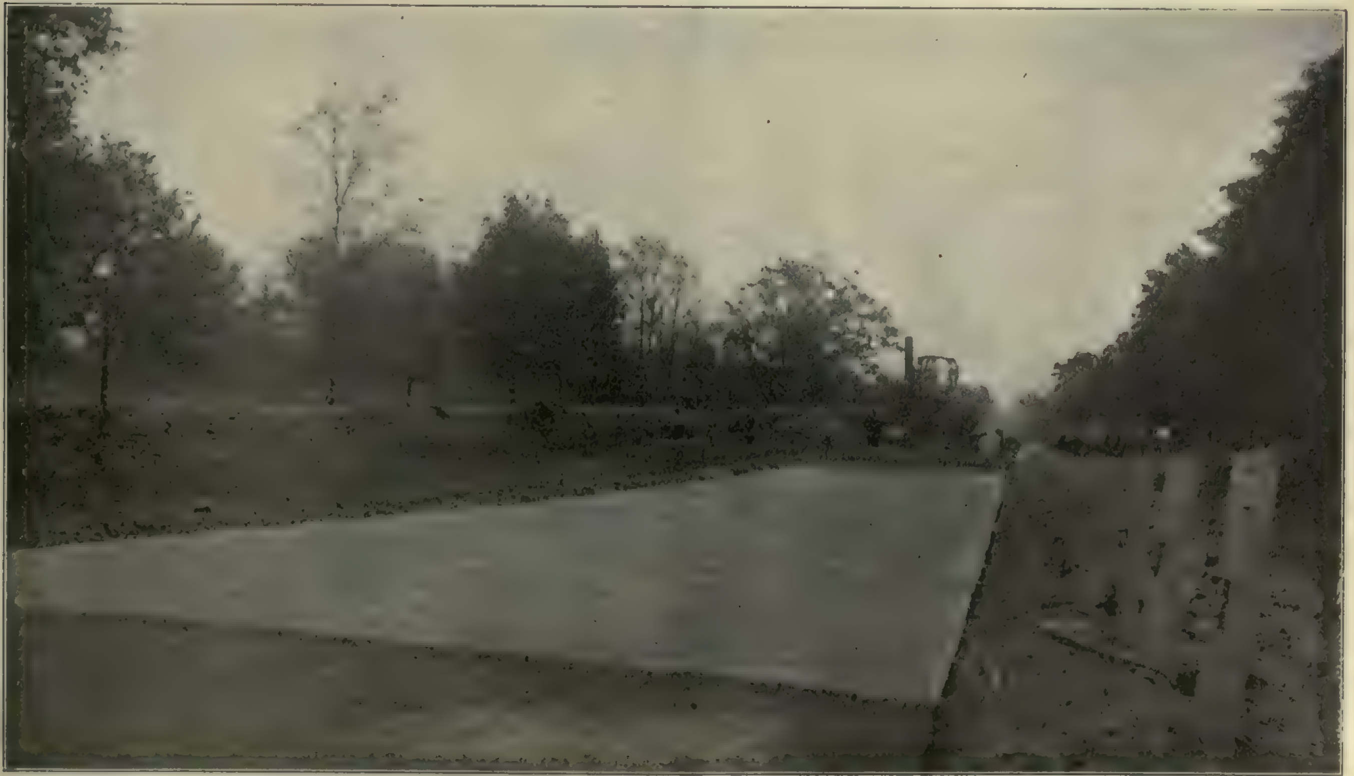
One of the oldest and probably the most important of the paved military roads is the Appian Way. It was commenced in 312 B. C. by Appius Claudius while holding the office of Roman censor. The Romans had learned the art of making paved roads from the Carthaginians. The extent to which they carried on work is shown by the 29 military roads which center in Rome.

In the middle ages chivalry found an origin in the wretched condition of the roads, which elevated the person enjoying the freedom of horseback to a position of supreme importance. And the knights roundly cursed the mire and the holes caused by bad drainage.

Scarcely a century ago periodic break-ups made the roads of northern Europe so dangerous that agriculture languished, rural districts become depopulated, highwaymen abounded, and government and education suffered.

To remedy these last conditions, McAdam and Telford, two British engineers, went back to the Roman idea of building roads on a good foundation, and devised the types of pavement that still bear their names. As these types form the basis of much modern practice they deserve brief mention.

Telford's idea was to prepare a level roadbed, then set by hand the bottom course of stones which were of uniform size. All surface irregularities were smoothed off by hammer,



CONCRETE PAVEMENT UNDER CONSTRUCTION IN NEW YORK STATE—COMPLETED AND COVERED IN FOREGROUND, FLOATED IN MIDDLE DISTANCE, BEING DEPOSITED IN BACKGROUND.

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[*] Part of a paper read before the Albany Society of Engineers, Albany, N. Y., April 24, 1917. Part of this paper was printed in the issue of Oct. 6; the balance will appear in a later issue.

[†] First Deputy Commissioner, New York State Commission of Highways.

and the joints filled with stone chips firmly packed by hand and hammer. Then the foundation was covered with a pavement of small hard stones to a depth of 6 in. This method gave a splendidly firm and smooth road, but, even in days when labor was cheap, a very costly one.

McAdam's method, the less satisfactory, was much cheaper. He omitted the foundation course, and spread a layer of stone, broken into cubes of about 1½ in., equally over the surface of the road to a depth of 10 or 12 in. These stones were left to be bound together by traffic, binding material not being used until long afterwards. By improving upon these two methods the highways of our own country were gradually developed. The natural difficulties of flood and dust and weak subsoil, of inadequate drainage and periodic break-ups and a host of others that bothered our ancestors were met in more or less satisfactory ways—chiefly less. And then suddenly came a revolution in traffic conditions that caught us all unprepared, and to the great natural difficulties of construction was added a mechanical difficulty that within a single decade has revolutionized the science of road building and placed it high among engineering feats.

In 1898, when the State of New York began road work, the roads were designed only for farm traffic, horse-drawn, with loads of from one to three tons. The idea of building these roads was to decrease the cost of transportation, extend the area of market gardening and in general to give better communication between rural centers. The usual type built was that of water bound macadam which resembled, to a large extent, the original macadam road, except that with the advent of proper road machinery, such as stone crushers and rollers, the road was more easily consolidated than by mere traffic and a smoother and more uniform surface obtained. These roads were made in depths of 6 and 8 in., which provided sufficient bearing power for all loads put on the highways at that time. That many of these same roads are being used today for loads of 16 and 20 tons—over five times their estimated bearing power—accounts for their rapid disintegration and high cost of maintenance.

With the advent of the motor car in 1902, came the first failures of our roads. The swift moving motor traffic, by the quick push and thrust of the tire, loosened the finer particles of the pavement which were gathered up in the vacuum that followed and carried off into dust. Even then the thickness of our roads was considered ample and the essential thing seemed to be to hold the crust of the pavement intact to prevent further raveling. Bituminous binders began to be introduced about 1905 or 1906 to get rid of the dust nuisance and to form a bituminous mat or surface that would not be disintegrated. In these years the development of motor traffic was so fast that it was almost impossible for road building to keep pace with it.

Then came another difficulty. Not only was motor traffic swift beyond all highway calculations, but with the greater reliability of the motor vehicle, the loading increased from ¾ ton or less to 8 and 10 tons and over, above the dead weight of the machine. So today in the design of our roads we have to consider the breaking and vibratory action due to the rapid movement and excessive wheel loading of the motor truck traffic. Furthermore, new roads mean new life to a community and in designing them the heavy increase in traffic must be provided for.

Because the best engineers of eight and ten years ago did not foresee the future of the motor truck and its use of our roads, many miles of pavement built then and before then must today be rebuilt in order to sustain the present traffic.

The increase of motor and other traffic on our improved highways is shown from the traffic census taken by this department in 1909, 1914 and 1916.

From 1909 to 1914 there was an increase of 216% in the motor vehicles and a decrease of 11½% in horse-drawn vehicles. From 1914 to 1916 there was an increase of 66% in motor vehicles and an increase of 12% in the horse-drawn vehicles. These figures are taken from an average of eleven roads in representative sections of the state outside the large cities. I give them merely as an indication to show the increases. Further, from reports thus far obtained by this department as to each truck and bus upon an estimated period of 40 weeks (eliminating the entire 12 weeks during the winter season) we learn that the traffic upon improved state and county highways for motor trucks amounts to 14,734,680 mi. for the 40 weeks, having 60,216,520 ton-mileage. Considering that this vast use consists of the impact of vehicles weighing from 5 to 15 tons and moving with an average speed of 12 mi. an hour, is it any wonder that there is great difficulty in maintaining in proper condition roads which are subjected to such punishment?

During the last year the destructive effect of the heavier wheel loads of the motor truck and bus variety did much damage to our roads about the time of the spring thaw when there was water in the ground and when the sub-soil under the pavement proper was wet and in more or less unstable condition. With the idea of determining what caused the break-ups, I had a survey made. The tabulation of the reports shows the following:

In the total of 1,879 roads, aggregating 44,400,000 sq. yd. of pavement in 4,733 mi., there were 358 roads affected by break-ups. The total number of square yards in these 358 roads was 14,138,000. Of this number of square yards, 758,000 were broken up, which is 5.4% of the number of square yards under consideration. This is much larger than it has ever been before. Of this 758,000 sq. yd., which were broken up, 18% was attributable to heavy and general traffic; 3.4% to motor trucks; 3.3% to motor buses; 50% to poor drainage; 25% to unstable subgrade; 11% to too thin pavement; 16% to poor bottom course. If you add these percentages together, you will find that they total 127%, because some of the break-ups were attributable to two causes.

This statement is not such a reproach to our road conditions as appears at first glance, as 460,000 sq. yd. of the total broken up was of roads that were built prior to 1910; all of them were water bound macadam and averaged only 6 in. in thickness.

The large percentage of 50 due to poor drainage can probably be accounted for by the fact that these roads ranged in age all the way from 7 to 16 years and in that space of time it is reasonable to suppose many of the drains had become filled and clogged so as not to perform their full function. While the percentages of heavy general traffic, 18; trucks, 3.4; and motor buses, 3.3; do not seem proportionately large to the other elements, it is a fact that many of the breaks commonly attributable to poor drains and thin pavement, which comprise a total of 61%, would not have occurred if it had not been for the motor truck and motor bus.

The increase in traffic will continue; the various agents of destruction will continue. The problem before us now is to build roads capable of sustaining the present loads put upon them with a factor of safety large enough to provide for the future loads.

It has been suggested that this problem could probably be met by legislation restricting the size of loads in accordance with the weight allowable per linear inch width of tire, as well as a further limitation of speed. To this end there is at present before the Legislature a law which, if carried out on the lines projected, will eliminate some of the heavier loads and heavier types of trucks that have caused great damage to our roads. I am heartily of the opinion that legislation should control conditions so that unreasonable traffic will be prevented from destroying the benefit the taxpayers ought to receive from the good roads movement. I am also a firm believer that we should build our highways better and design them to sustain greater loads than has been our custom in the past. This for two reasons: First, it is certain that our traffic has in the last few years quadrupled in volume and will inevitably become heavier; second, the heavy motor truck seems to be the assured means of transportation from outlying districts to railroad depots and also for much short-haul freight. Through the motor truck our state industrial and agricultural sections will develop independently of railroads if only they can be reached by improved highways. When the fast growing web of connecting routes and systems is completed, New York State will be a beehive of industry. I believe that with a certain amount of restrictive legislation and with the strengthening of the present types of pavement, we can meet this problem of motor truck traffic.

The experience of the New York State Highway Department affords suggestions about the various types of pavement, so let us briefly consider those we are now building. For this purpose, I think we can safely classify them into the semi-durable and the durable types. The semi-durable types are represented by the gravel road; the water bound macadam, plain and surface treated; the bituminous macadam, penetration method; and the concrete bituminous road, put in this class because of New York State's experience with it.

LAYING BITUMINOUS MACADAM (MIXING METHOD) ON A NEW YORK STATE ROAD.

The durable types—or probably it would be wiser to say the more durable types—are the bituminous macadam, mixed type; the brick pavements, and the cement concrete roads. Many patent types of pavement come under this latter class and are good, but as they are no better than those on which we pay no royalty, I will not waste time on their discussion here.

Gravel

The gravel road is essentially a light traffic road. It is low in first cost, agreeable to ride over and good for horse-drawn traffic in the summer months. During the late fall, winter and spring months it is slippery and dangerous to motor traffic on account of the heavy crown required to keep it in condition. Under heavy traffic, it has a tendency to rut longitudinally, and it requires heavy maintenance. On account of these conditions very little of it is built. I speak of it only because in the early days of our improvement quite a few miles were built in the state, which require yearly maintenance—$587 per mi. for 173 mi. maintenance charge in 1916.

Water Bound Macadam

Water bound macadam is the type of which the greatest number of miles are being built in the state at the present time. It is also the type of pavement that seems best adapted to the needs of light traffic and local conditions on many of our market roads.

As experience has shown us that this class of road lasts but a short time unless surface treated, we will consider this type only as having a surface treatment. Owing to the necessity of eliminating the dust and mud nuisance and the subsequent disintegration, it has been found necessary to provide some sort of a surface coat. This has been very effectually done with the treatment of light oil or tar and screenings of fine gravel or coarse sand. This class of road costs about $10,250 per mi. for a 16-26 ft. pavement, 6 in. thick. Its low cost of construction is one of its greatest advantages. It gives a good foothold for horses and is comparatively noiseless. Among its disadvantages may be noted its high cost of maintenance, which in 1916 amounted to $906 per mi., for 2,391 mi. Water bound macadam does not require particularly rigid inspection during construction except when the act of puddling is reached, for there the ultimate result depends upon the road being properly locked, shaped and filled.

HILLSIDE BRICK LAID ON A NEW YORK STATE ROAD—READY FOR GROUTING IN FOREGROUND.

In the application of the surface treatment, it is essential that the top surface be properly bonded and swept clean in order that the oil or tar applied may adhere. Oil or tar is not used when the road is first completed, as it has been found that better results may be had by first giving it some service use. Any roads that are finished in the fall of the year, too late for service use and to receive a treatment of oil and tar, are treated with calcium chloride; that is, applying oil or tar on part of the road and using the calcium chloride for the rest. This helps to maintain sufficient moisture to prevent raveling until the following year when the oil or tar is put upon the road. This class of treatment has been very satisfactory and the results gained in the last two years are much better than when it was not used.

The large failure of this type of construction is probably due to insufficient filling and rolling. This is probably in a way due to the fact that the building of penetration roads, which have required much less rolling to get results, has given to the contractors and inspectors the idea that good work could be had without proper filling and the large amount of rolling necessary for the proper consolidation of this type.

Bituminous Macadam, Penetration Method

Bituminous macadam in general is not wholly satisfactory. When built on hills it is not safe to apply a flush coat, consequently the road is far from being waterproof when first constructed. This defect is remedied by the traffic which grinds up the stone and forces it into the voids, but the lack of uniformity in the finished results of these roads has many times been discouraging. These pavements cost about $13,000 per mi. for a 16-26 ft. pavement 6 in. thick.

In building the bituminous macadam, penetration method, it is impossible to get full consolidation, and consolidation by traffic afterwards makes this type ridgy. As yet the tendency of this type of pavement to creep under traffic has not been solved. Wonderful examples where this condition has almost been eliminated have occurred, but under similar conditions one road may be a success in this respect and another a near failure. Often work done by the same contractor, under the supervision of the same engineers, using the same care and inspection of materials, may result in a road which will lose its shape and disintegrate in spots within a short time. The worst point of this penetration type of construction is that the men who know what they have done and what they are doing, cannot be sure of the results they will obtain.

Among the disadvantages of this type of construction it may be said that it is slippery, has a fairly high cost of maintenance ($493 per mi. during 1916 for 2,534 mi.); and that during repairs the road must be closed to motorists or else it covers their cars with oil and tar. These roads have the advantage of being dustless and easily repaired when street openings are made or when depressions occur.

This year we are trying the use of larger stone, more uniform in size, in the top course, with the idea that the stones may be rolled until they are firmly locked and yet retain uniform voids for the application of the bituminous material. This should prevent the creeping and raveling.

Concrete, Bituminous

This is a type of road with a second class concrete foundation generally 5 in. in thickness. It has a skin coat application of tar which is an attempt to combine the resilient and rigid form of pavement and has not been satisfactory. It has the disadvantages of other bituminous macadam and the further one that the surface peels off the concrete foundation. Its maintenance cost is high, being $1,080 per mi. for 238 mi. in 1916. The department has been experimenting with some pavements of this type with the idea of getting a surface coating that would stay, and in two cases the results have been very satisfactory, but no conclusions can be reached until they have had a longer service test.

Bituminous Macadam, Mixed Method

This type of pavement gives greater satisfaction than the bituminous macadam, penetration method, and is more costly. If constructed on a concrete base, it is certainly one of the more durable types of pavement. This type of road is divided generally into two classes: the open mix and the tight mix. The open mix has a larger percentage of voids than the average bituminous pavement. Whether or not a seal coat is used with the open mix type, subsequent wearing brings early deterioration and disintegration. In a similar manner, variations in the size of stones will cause uneven wear. Both these conditions tend to produce a bumpy pavement. There is also danger when this type is subjected to heavy traffic, on account of the large percentage of voids in it, that further consolidation may take place, giving an uneven surface which wears rapidly.

The tight mix is that generally used in the mixed type and when made with fine aggregate it is called "Topeka." As there is not sufficient stability in the aggregate to withstand the heavy traffic, it is increased by using a very low penetration asphalt. This pavement, too, has a tendency to form into waves under very heavy traffic conditions and on some roads adjacent to New York City good success has been had with it. It costs about $21,000 per mi. for a 16-26 ft. pavement. Its average cost for maintenance for 1916 was $205 per mi. for 25 mi. Its success and wearing qualities are dependent on the proper size and grading of the aggregate and the percentage of asphaltic cement incorporated with it. If too much, the pavement gets soft and ruts on top; if too little, the particles are not sufficiently bonded together and rapid disintegration follows. Most of these pavements are built with just enough asphaltic cement to hold them together, depending upon the motor oil dropped from the cars to seal the pavement and prevent surface disintegration by the elements. The bituminous macadams cost from $18,000 to $32,000 per mi. for a 12-26 ft. pavement, 2-in. top and 5-in. concrete foundation. Its main advantages are having a smooth surface with no dust or mud and being practically noiseless. One of its main disadvantages is that it is slippery in wet weather.

Brick Pavements

These pavements have not proven entirely satisfactory for country roads in this climate as it is much more difficult to provide proper drainage than it is on city roads where the sewers keep the earth subgrade comparatively dry. In the cities brick pavements may well be used. They cost about $25,000 a mi. for a 16-26 ft. pavement on a concrete foundation. Among their advantages it may be mentioned that they are durable and not particularly slippery. The disadvantages of this type are the cracks along which the bricks disintegrate and the lack of uniformity in the brick because of different degrees of vitrification. However, some of this type has been very satisfactory and has done service for years. (Cost, $176 a mi. in 1916 for 267 mi.)

We have started in the past year to use brick of 3 in. in depth. This will give a saving of one-quarter in the freight rate and also a small saving in the price of the bricks at the kiln. However, we are not using bricks of this depth on sand cushion, but are using them on cement sand cushion in the form of a rigid type of pavement. As yet, we have not laid any of this monolithic type, but we shall probably do so in a short time.

Cement Concrete Road

The cost of these roads for pavements 6 in. in thickness is $15,000 per mi. They have the advantage of low first cost, are dustless, not slippery and repairs do not necessitate detours or closing to triffic and they have low maintenance charge ($41 a mi. in 1916 for 151 mi.). Among their disadvantages it may be mentioned that there is a certain amount of glare for the first year or two, and that the cracks, though not detrimental, present a bad appearance. We are, however, using more and more of this type of road because it stands so well under traffic. Our department has now under contract 306.25 mi. of this pavement, so that should we stop building concrete roads today, when these roads are completed, New York State would have 491.46 mi. of concrete pavement.

On the Schenectady-Albany road, which carries the main traffic between these two cities, our traffic census of 1916 showed 608 horse-drawn and 1,365 motor-driven vehicles. This is an average of two days taken from 8 a. m. to 7 p. m. This pavement was laid and completed early in 1914 and today hardly shows the marks of this heavy traffic. The traffic conditions here are much more severe than shown by this traffic census, as there is much motor truck traffic between these two cities. On this and many of the other pavements built by this department in 1913 and 1914, the broom marks, which are ¼ in. in depth at the outside, have hardly worn off, so that for a period of at least two years there is less than ⅛ in. wear in all cases on these pavements. If we figure 2 in. as the usable depth of this type of pavement, we should have at least 16 years' wear before it became necessary to resurface.

All of the costs given under the different types of pavement mentioned are on the 1915 basis of labor and materials. As each letting during the last year has shown an increase there is no average for 1916 that I can give and so I have used the figures of 1915.

Washington State Road Work*

BY ROBERT L. SPARGER†

This convention convenes at a critical time in the history of our country. Never before has there been the imperative need of patriotic service and loyalty to the American standards; and let us here pledge ourselves to our government, as an organization, ready to serve in every way possible.

The necessity and economic value of good roads is now realized in all parts of the country, and where highway improvement has not been completed it is well under way. But this was not the opinion in the days when the Washington State Good Roads Association was organized, as the worthy members of the "Old Guard"—to whom we do honor—at this convention, will tell you. In those days good roads advocates were to be taken lightly, if not ridiculed; and it was difficult work to even convince the farmer that good roads were to his interest and welfare. However, these days are now but a memory, and like other recollections of the early days of Washington, dear to each of us, our good roads work has not only been instrumental in the upbuilding and development of our state but it has established a close cooperation and warm friendship among the residents of the various parts of the state.

We are now nearing the completion of our state highway system, as determned by our 1913 Legislature. There is a great deal of surfacing to be done before we can call our state roads "first-class," but they are all located and for the most part in traversable condition.

The wisdom of the platform adopted in the Washington good roads building program, of economically constructed roads so located as to serve the entire people of the state, has been demonstrated in a most gratifying manner. The majority of the automobiles of the state are today owned by the farmers and motor-driven tractors, trucks and other implements are being widely introduced into the agricultural industry. A goodly percentage of the automobiles are owned by the professional men and traveling representatives of our large wholesale establishments. As a matter of fact there are but comparatively few cars operated solely for pleasure.

Wherever you go, whether it be through the fertile valleys of Western Washington, into the mountain regions, the wonderful reclaimed sections of Southeastern Washington, or the rolling wheat fields of the Inland Empire, the beneficial results of good roads are evidenced.

The urgent need of a comprehensive system of national military highways is today absorbing the interest of all good roads advocates. We have need of thought and attention to roads of this character within our own state. There are today miles of our Washington coast line along the rugged shores of the western side of the Olympic Peninsula, and other sections of Southwestern Washington, which would be absolutely inaccessible to troops or artillery. The same condition prevails in parts of Oregon and California. Therefore, I believe, we should give careful attention to the Pacific Coast military road, and urge that it be constructed as speedily as possible. Memorials were introduced in the last session of the legislatures of Washington, Oregon and California petitioning Congress to give this matter early attention, but as yet no decisive step has been taken toward getting this work under way. I believe we should encourage an active publicity campaign all along the Pacific Coast, setting forth the necessity of this highway for coast defense and urging immediate action.

The experience of European countries has taught us the need for military use of wider and heavier highways than the greater part of our American roads. I read a report a short time ago which strongly impressed these facts upon me. I quote it as follows:

"The Society of Automobile Engineers in cooperation with the Quartermasters' Department has completed a set of specifications, as basis for competitive bid for 35,000 motor trucks required by the army. These specifications are based on the experience gained from the wholesale use of motor trucks on the Mexican border. They call for a larger, stronger and more expensive machine than would be necessary were they to be used over good or even average roads."

Were our national military highways system even under way the millions saved on this one item could be converted into useful channels and materially aid in the permanent improvement of these roads, thereby serving a two-fold purpose—not only the efficient transportation of troops and munitions, but the alleviation of freight congestion throughout the country.

The first move on the part of the federal government to assist in upbuilding the nation's roads was announced last year when President Woodrow Wilson signed the Bankhead-Shakleford good roads bill. This measure provides for the appropriation of $75,000,000 from the federal treasury, in the expenditure of which a like amount will be appropriated by the various states and this joint money will be used on roads mutually agreed upon by the state highway departments and the secretary of agriculture. In addition to this, $10,000,000 will be expended by the federal government in the construction of roads and trails through the national forests.

This measure was adopted prior to the declaration of war and did not take into consideration the construction of military roads. A measure known as the Chamberlain-Dent Military Highway Bill was recently introduced in both branches of Congress by the chairman of its military affairs committee. This bill asks for an appropriation of a quarter of a million dollars for preparing plans through the War Department for a national military road system, also co-operation with states with military needs from a highway standpoint. This bill is now in the hands of the military affairs committee. This measure is a long step toward taking care of this branch of national highway construction, and should, I believe, receive the support of this organization.

In my opinion more active steps should be taken to impress upon the public the close connection between good roads and the success of our food conservation program. Good roads and increased agricultural area go hand in hand. Every mile of good roads enables the farmer to extend his operations and enlarge his field of usefulness. Good roads particularly encourage diversified farming and the breaking up of large tracts into small farms—thereby greatly relieving the congestion of the cities and creating better opportunities for the upbuilding of homes, improvement in the condition of living, and better citizenship.

This phase of the good roads movement alone demonstrates the need of consistently carrying forward our road building program even during this period of national adjustment to war conditions. However, the greatest care should be used in advocating the establishment of new roads. Their absolute need and utilitarian value should first be determined, and if it is found that the establishment of this or that road will actually benefit the farmer and give him a new road to market, well and good; but I am strongly opposed to even considering a purely scenic highway until our farm to market roads are in first-class condition. The present Washington state highway system, which has been consistently supported by this organization, is comprehensive and—in conjunction with the various county highway systems—will adequately serve the needs of all parts of the state, in my opinion. Every effort should be bent towards its early completion.

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*From the annual message of the President to the 18th annual convention of the Washington State Good Roads Association, Bellingham, Wash., Sept. 27-28, 1917.

†Former President, Washington State Good Roads Association.

The following legislative committee was appointed at our last convention: C. L. Morris, Chairman, Seattle; Eli Rockey, South Bend; W. A. Bolinger, Methow; L. H. Brown, Spokane; and C. L. Mackenzie, Colfax. Under their guidance our legislative work during the last session was entirely governed by the report of our last resolutions committee. I am glad to say that the majority of our resolutions were favorably acted upon.

The state highway appropriations made by the last Legislature were, for the most part, made in accordance with the new federal aid road act. The state highway commissioner reports that all thirteen highway projects submitted have received the tentative approval of the federal authorities and project agreements are executed or held pending slight modifications in plans and specifications.

Such delays as have been experienced in the operation of the federal aid road act have been occasioned by minor matters of reviewing and approving plans, contract forms, etc., all of which has required considerable correspondence and time. The government fiscal year begins July 1 and no federal aid project drawn against the appropriation for a given fiscal year can be contracted or work begun until after July 1. This will practically throw all such projects over into the succeeding working season.

When we are disposed to criticise the delays in our federal aid road program it is well to remember that the federal authorities are organizing a new branch of national activity at a time when the immediate war demands are absorbing the time and attention of the secretary of agriculture and his department chiefs; and these very delays may well prove to be a blessing by the securing of more normal prices in highway work than have been offered this year.

The shortage of labor and the continuous rise in wages and prices of materials have seriously hampered our state and county road building programs this year. Our highway work will unquestionably show an increase in cost of from 35 to 50% this year, and we cannot, therefore, hope to secure anywhere near the mileage heretofore expected under similar appropriations.

We assisted in maintaining the mill levy for state roads and the mill and one-half levy for permanent highways. The money derived through the maintenance of these levies is of such importance to our state highway system that I believe active steps should be taken to secure their permanency until such time as our arterial highways are completed.

"Maintenance" is a threadbare topic in good roads work. We have advocated and talked maintenance for years, but even today we have not worked out a definite, efficient system for the maintenance of our state and county highways. Many plans and suggestions have been made, but I trust that this convention will get down to business and give this serious problem proper attention.

Our last Legislature enacted a law whereby the maintenance fund for the state highway system is returned to the different counties in proportion to their assessed valuation and the maintenance work on these state roads placed in the hands of the different county commissioners. This, in my estimation, was an ill-advised move, as it has a tendency to work a hardship on the large counties having a small assessed valuation but considerable length of state roads to look after. On the other hand the wealthy counties have more than enough to look after their roads, but are prohibited from assisting their neighboring counties even where it is needed most. The State Highway Department has been invested with power to construct the state highway system and, therefore, is in a better position to judge the needs of the different roads from a maintenance standpoint, and in fact look at the state highway system as a whole rather than as a series of units. For these reasons I believe the highway department should be charged with the proper maintenance of our state highway system and be given authority to apply the maintenance fund where needed most.

During the past summer King and Snohomish Counties have each completed their respective sections of the Cascade-Scenic Highway and the Chelan County section is well under way. That portion of the latter county's roads which is not completed is under contract and will be ready in the early spring. This gives us another cross-state road and a more direct connection with Wenatchee and the Okanogan district. It is important to the state in that it will insure the further development and opening up of new farming districts.

There is a great deal of other important county work under way, to enumerate which would require too much time. However, particular mention should be made of the good roads work under way in Pacific and Snohomish Counties through their respective road bond issues.

We are fortunate in the State of Washington in that our farm to market roads are rich in scenic beauty and also offer an ever changing panorama to the visiting motorist. Thousands of automobile tourists from all parts of the country have visited the State of Washington during the past season. The registrations at the headquarters of the Automobile Club of Seattle show the arrival of visitors from 31 different states, and several from Hawaii, Japan and China. The Inland Automobile Club of Spokane reports the registration of motorists from 28 different states. In checking over the records it is found that the majority of those registering from a distance are from California, but there is also a fair percentage from the Eastern and Middle Western States. This is convincing evidence of the value of the publicity campaigns of the National Parks Highway Association, the automobile clubs and kindred organizations.

Much of this publicity work will now be handled through the Pacific Northwest Tourist Association, a new organization of business men of Oregon, Washington and British Columbia, led by I. M. Howell, Secretary of State of Washington, Ben Olcott, Secretary of State of Oregon, and H. C. Brewster, Premier and Minister of Finance of British Columbia, for the purpose of exploiting and popularizing the Pacific Northwest as the summer playground of America.

The states of Washington and Oregon each appropriated $45,000 and British Columbia appropriated $25,000, making a total of $115,000 available for this work. These appropriations are handled through the Department of Secretary of State and from all indications will go a long ways toward upbuilding the tourist travel to the Pacific Northwest.

I believe a concentrated move should be made on the part of all organizations interested in the welfare and development of this state for the preservation of the magnificent forests along our main highways, particularly those lying outside the boundaries of the national forests. A sufficient strip should be set aside along these roads to provide for the construction of comfort stations, camp fire locations and other facilities for camping with a reasonable degree of privacy, under the jurisdiction of the state. In other words, this would provide a comprehensive state park system and add greatly to the attractiveness of our roads. I believe further that the planting of shade trees along the state and county roads by the local civic bodies should be advocated throughout the prairie sections of the state.

There may be a tendency on the part of some to feel that this is an inopportune time to take up a matter of this nature, but we should bear in mind that the timber industry is reaching larger proportions today than ever before in the history of our country and once these forests are devastated their grandeur can never be restored. Therefore, no time should be lost if their beauty is to be preserved for posterity.

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

OCTOBER 13, 1917

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF "GOOD ROADS," published weekly at New York, N. Y., for October 1, 1917.

State of New York, County of New York, ss.:

Before me, a Notary Public in and for the State and County aforesaid, personally appeared E. L. Powers, who, having been duly sworn according to law, deposes and says that he is the Editor of "Good Roads," and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act. of August 24, 1912, embodied in Section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor and business managers are:

Publisher—The E. L. Powers Co. (Inc.), 150 Nassau St., New York, N. Y.
Editor—E. L. Powers, 150 Nassau St., New York, N. Y.
Managing Editor—T. A. Hulbert, 150 Nassau St., New York, N. Y.
Business Manager—E. L. Powers, 150 Nassau St., New York, N. Y.

2. That the owners are:

The E. L. Powers Company (Inc.), 150 Nassau St., New York, N. Y.
E. L. Powers, President and Treasurer, 150 Nassau St., New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities are: No bondholders, mortgagees or other security holders.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is: (This information is required from daily publications only).

E. L. POWERS, Editor.

Sworn to and subscribed before me this 1st day of October, 1917.

(Seal.) FREDERICK CRYER,
Notary Public, New York County.
My commission expires March 30, 1919.

ENEMY ALIENS TO RELIEVE LABOR SHORTAGE

Some application of the conscription law to aliens resident in this country may be made eventually. The matter has been considered seriously and it has been proposed to frame a measure providing for the use of nationals of countries with which we are at war in "non-military" service.

Why not put enemy aliens at work on the roads?

It is now generally realized that continued road work is essential to the military success and the commercial and industrial welfare of the United States. Even with the fullest use of labor saving machinery and equipment very large numbers of workmen are necessary. There exists a very serious labor shortage and such laborers as are obtainable at the prevailing high wages are apt to be inefficient and unreliable.

Thousands of unnaturalized residents, citizens of enemy nations, are following their various vocations, unmolested, practically unrestrained, and to a great extent, unwatched. They constitute a menace—potential at least—that should be dealt with promptly and effectually. By putting them at work on the roads two results would be achieved—the labor shortage would be relieved and the enemy alien element in the populaton could be made profitable instead of a source of annoyance, or worse.

It would be quite feasible to register and draft these men as men have been registered and drafted for the National Army—in fact those between the military age limits are already registered. For road work it would be well to make the lower limit lower and the upper limit higher, both because it would be possible to use advantageously the men above and below the ages set for the army and because it would take care of a larger number of aliens.

A system of employment similar to the best existing systems of convict labor could be developed, paying wages sufficient to keep the men's dependents from want and using men near their homes to save transportation charges.

With enemy aliens and prisoners of war, imported from the French and English prison camps, put at work on our roads we could accomplish efficiently and economically a considerable amount of work that under existing conditions will have to be deferred or prosecuted at too great a cost.

DANGEROUS SIGNALS FOR GRADE CROSSINGS

One of the principal eastern railroads has recently installed at grade crossings a number of warning signals that are very far from satisfactory and that, unless shortly put into working order, are not likely to materially lessen the hazards of the intersections they are supposed to protect.

The signal referred to consists of an upright carrying disks and lights indicating safety and danger by the usual colors, and provided also with a bell. The approach of a train within a certain distance of the crossing sets the signal at danger and starts the bell. The signal remains at danger and the bell continues to ring until the train has passed over the crossing. The mechanism is so arranged that in the event of any accident to it the signal will indicate danger and the bell will continue to ring.

The principle of the device is, of course, correct, and if it worked with even a reasonable degree of certainty the signs might be expected to materially reduce the likelihood of accidents. As a matter of fact, through improper installation or adjustment, or some mechanical defect in the mechanism, the signals remain set at danger for hours and sometimes days.

Meanwhile it is necessary to continue to use the crossings and motorists and others must exercise the same precautions as if there were no signals—even greater precautions, in fact, for the warning implies that there is danger though it is not apparent. Again this would be on the side of safety—though annoying—were it not that several experiences of this kind will lead to a general disregard of the warning when set at danger.

The railroad grade crossing hazard is very real and demands the best efforts of all concerned in lessening it as much as possible. Absolute safety can, of course, be insured only by the separation of grades, but the enormous costs involved put that solution a long way into the future. There are, however, many ways of safeguarding existing crossings —some good, some bad and some indiffirent. Only those that really make travel safer should be allowed and the state highway commission, public service commission or some similar body in each state should exercise careful and thorough control of everything done. If such power is not vested in any competent body, laws should be passed conferring it upon the proper authority.

Redding's New Lighting System[*]

BY E. A. ROLISON[†]

Previous to October, 1916, the streets of Redding were lighted with about fifty arc lamps of the enclosed type together with a few small incandescents. This equipment was owned and operated by the local power company at a cost to the city of approximately $300 per month. The results obtained from this system were very unsatisfactory to the city council, as well as the public in general, for at times it was found necessary to economize and certain districts were forced to do without street lighting altogether.

About Oct. 15, 1916, the new system was put in operation. This system consists of 116 Mazda street series nitrogen filled lamps, ranging from 100 to 600 cp., located at all street intersections. The larger units are installed on ornamental standards in connection with Novalux units; the smaller units are installed in connection with prismatic refractors and are suspended from cables and mounted on brackets. The balance of the equipment consists of about 15 mi. of overhead construction and underground cables and conduits together with station equipment consisting of constant current transformers, automatic time switches, lightning arresters, meters, etc., all of which have been installed and are owned and controlled by the city. The total cost of installing approximated $8,000, considerable being saved by the arrangement of a joint pole agreement with the telephone company.

All of the electrical energy consumed is measured by the power company's meter and checked by the city's meter. Automatic time switches are so arranged that a moonlight schedule can be operated in the residence and more remote districts, while an all-night schedule prevails in the business and downtown sections, thus giving the maximum amount of economy, when economy is desired, together with the highest rate of efficiency at all times so far as control is concerned.

A special meter rate has been established for the above system by the Railroad Commission to fit our own peculiar condition. Under this rate our maximum monthly charge was $97.95 for the month of March at which time the entire system was being operated on an all-night schedule with no attempt toward economy. During the month of July, however, when the business section was being operated on an all-night schedule and the residence district on a moonlight schedule our monthly bill amounted to only $61.20. Lamp renewals to date have averaged less than $10 per month and our maintenance has been practically nothing. The life of lamps has been considerably increased due to the fact that an average of about 5% below normal has been maintained, which, while having no noticeable effect on the brilliancy of the lamps, adds greatly to their life. This fact can be readily realized by the fact that we have lamps that have been in operation for over 3,000 hours which were guaranteed for only 1,000 hours.

Adequate provision has been made for future use, the entire system being capable of carrying 50% above its present load. Conduits have also been installed under all of our recently paved streets, convenient to all curbs in the business section, as we realize the benefits to be derived from good street lighting and we believe that when our system is finally completed it will serve the purpose well.

At a meeting held by the Board of City Trustees on March 8, 1917, the merits of the new lighting system were discussed and it was unanimously agreed by the board that the results obtained had been entirely satisfactory.

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[*] Paper presented at the annual convention of the League of California Municipalities, Santa Rosa, Cal., Sept. 24-29.

[†] City Electrician, Redding, Cal.

Plan for Improving State Roads in Pennsylvania Boroughs

The question of improving state roads that pass through boroughs in the State of Pennsylvania has been taken up by the State Highway Commissioner with the officials of the various boroughs with a view of securing the improvement of the roads. Thirty-nine boroughs are affected, and it is hoped that these will be willing to join the state in the work.

On account of the proposed work being located where labor and material can be secured to advantage and the work done by local contractors, it is said that lower prices can be secured than for larger contracts located in the rural districts.

First Federal Aid Road Contract Awarded in Arkansas

The contract for the construction of the surface on the road to Camp Pike in Arkansas was recently awarded by the State Highway Commission, after the highway had received the approval of the Secretary of Agriculture as a federal aid project. The work will cost $125,398.08, of which the government will pay $52,398.08, the state $53,000 and the county $20,000.

According to report, the base, bridges and culverts have been completed on the main road to the cantonment, and 80% of the grading on the Batesville Road is finished. Warrenite was selected for the surface, and the contract was awarded to M. D. L. Cook, of Little Rock, Ark. It is expected to complete the road in three to four weeks.

Proposed Plan of Cooperation in Snow Removal in New York City

That thorough cooperation between the municipal authorities and the transportation interests of New York City is necessary to the solution of the snow removal problem in that municipality is the substance of the first report of a special committee of the Motor Truck Club of America.

The committee which was appointed by President Stephens of the club consists of G. A. Green, Chairman, E. H. Nelson and J. K. Orr. At a conference with Commissioner J. T. Fetherston, of the Street Cleaning Department, the committee thoroughly discussed the snow removal problem with the particular object of securing cooperation between the department and the transportation interests of the city

In the Boroughs of Manhattan, the Bronx and Brooklyn, there are about 23,312,000 sq. yd. of street area from which snow has to be removed. In the opinion of Commissioner Fetherston, a 12-in. fall of heavy snow would effectually blockade traffic on at least 605 of the 946 mi. of street in the three boroughs for at least one day and seriously retard traffic for at least six days. The result would be immense losses to merchants and transportation interests and a very serious fire hazard. To meet conditions such as these and to minimize the risks as well as the losses entailed would, it is stated, require, in addition to the maximum force procurable by the Street Cleaning Department, the services of at least 10,000 trucks for a period of about 24 hours.

It was agreed at the conference that it would be impossible to divert motor trucks from the work of moving incoming freight, especially food and coal, no matter what traffic conditions, short of a total blockade, might exist. It was felt, however, that it might be possible to furnish trucks for a limited period for snow removal in great emergencies provided it were possible to declare an embargo on outgoing freight for a corresponding short period. It is pointed out by the committee that the interests concerned in transportation are the producers of freight, the transportation agencies and the city officials responsible for traffic conditions, and that a plan for bringing together these interests in cooperative work will resolve itself into some form of regulation or law under which an embargo can be placed on outgoing freight, thus releasing for use in snow removal a portion of the equipment of the transportation companies. The committee suggests the holding of a conference to provide an opportunity for the formulation of a definite plan along these lines and in this connection makes the following suggestions:

1. That transportation interests be prepared to assign some proportion of their total horse-drawn and motor-driven equipment for service in emergencies, to relieve blockades.
2. That this equipment be made available in conjunction with the regular force of the Department of Street Cleaning and on call by some authoritative official, such as the Commissioner of Police.
3. That the Department of Street Cleaning organize and supervise the work of the companies furnishing the transportation equipment and likewise arrange to pay for such service.
4. That merchants agree to furnish a certain proportion of their janitors or other handlers, whose services might be spared during emergency periods, so that the force thus provided could be utilized in loading the trucks of the transportation concerns.
5. That as far as possible the regular drivers of the transportation interests should be employed in this work and some incentive offered to these men so as to secure their full cooperation in rapidly clearing the streets of snow.
6. That local transportation companies, such as those engaged in hauling coal, be provided by the city with detachable plows and that such companies agree with the city to furnish a portion of their motor-driven equipment to plow snow for roadways contiguous to their places of business, following the plans initiated by Z. O. Nelson & Sons, of Brooklyn.

Minnesota State Road Inspection

C M. Babcock, State Highway Commissioner, and J. H. Mullen, Deputy Commissioner of Highways, of Minnesota, have just completed a trip of inspection over the state roads, having covered 650 mi. They found the roads in good condition, and noticed especially that the counties were paying more attention to maintenance than ever before.

They visited St. Cloud, Alexandria, Fergus Falls, Breckenridge, Moorhead, Detroit and Long Prairie, and took up with the county commissioners of Stearns, Douglas and Otter Tail Counties the levy of a special tax, the proceeds of which will be applied to surfacing the road between St. Cloud and Fergus Falls, a distance of 150 mi. The several county boards agreed to the tax. These counties, Commissioner Babcock reports, are figuring on a heavy tax in order to get a larger share of the federal aid.

The commissioners of Anoka and Wilkins Counties have agreed to raise their county road levy from 3 to 5 mills, under the new state law, for general highway improvement. This will produce an increased revenue in those counties of $118,000 next year.

Death of William W. Marr

William W. Marr, Chief Highway Engineer of Illinois, died at his home in Chicago on Oct. 3, the result of a complication of diseases.

Mr. Marr was appointed to the above office about three years ago when he was consulting Engineer of the Sheridan Road Improvement Association of Chicago. When the work of the former State Highway Commission was placed under the authority of the Department of Public Works and Buildings through the operation of the administrative code bill, he was reappointed by Governor Lowden.

He was influential in securing the passage of recent legislation relating to the permanent improvement of an extensive highway system in Illinois by means of a state bond issue.

Mr. Marr was 44 years old, and leaves a wife and four children. He was a member of the American Society of Civil Engineers.

Examinations for Road Inspectors in New Jersey

About eighty candidates for positions as inspectors on road work under the New Jersey State Highway Commission were recently examined in Trenton and Newark.

After a written examination by the State Civil Service Commission the candidates were subjected to oral examinations conducted by James H. MacDonald, former State Highway Commissioner of Connecticut. Two examinations were held by Mr. MacDonald, one at Trenton on September 27 and the other at Newark on September 28. The examinations covered the construction of gravel, water bound macadam, bituminous macadam, concrete, stone block and brick pavements. Samples of the various materials entering into the construction of these pavements, from the subgrade to the wearing surface, were placed before the men examined, who were required to demonstrate their knowledge of the various substances.

This examination was the third of its kind conducted by Mr. MacDonald for the New Jersey authorities. The first was held in 1915. The oral examination is believed to possess certain advantages over the written type and it is felt that its conduct by a man from outside the state obviates any possibility of unfairness because of personal bias.

The members of the Civil Service Commission are: John Dyneley Prince, President; Gardner Colby, Chief Examiner and Secretary; Edward H. Wright; Wm. D. Nolan; Albert L. Stillman; Wm. K. Devereux.

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The Highway Between Paris and Houston, Texas, has been officially designated as the "Red River-to-the-Gulf Highway."

Towns and Villages on Long Island, outside of Greater New York, will authorize road and street improvement amounting to $1,000,000, according to report.

Improved Roads in Minnesota and an increase in automobile owners in the state are credited with the unusually large attendance at the State Fair this year.

The Authorities of Brown County, North Dakota, recently voted approximately $40,000 for use in improving rural highways during the coming year. County bridges will receive the benefit of the expenditure of $33,822.

The Town Board of Manhasset, Long Island, recently voted to apply the town's apportionment of automobile license funds, $15,531, to the improvement of the Shore Road from Reid Avenue to Baylis corner, Port Washington.

The Supervisors of Lee County, Illinois, have voted to raise $36,000 by taxation to pay for the first half of the county's share of constructing the Lincoln Highway. Other counties traversed by the highway have taken similar action.

MEETINGS

Calendar of Coming Meetings

Oct. 16-18.—League of Kansas Municipalities.—Annual convention, Wichita, Kan. Secretary, Homer Talbot, University of Kansas, Lawrence, Kan.

Oct. 16-19.—Southern Appalachian Good Roads Association.—Ninth annual convention, Nashville, Tenn. President, Henry Robert, Bristol, Va.

Oct. 17-18.—League of Minnesota Municipalities.—Fifth annual convention, St. Cloud, Minn. Secretary-Treasurer, Richard R. Price, University of Minnesota, Minneapolis.

Oct. 29-30.—Oklahoma Society of Engineers.—Annual convention, Oklahoma City, Okla. Secretary-Treasurer, H. V. Hinckley, Oklahoma City, Okla.

Nov. 19-24.—City Managers' Association.—Annual meeting, Detroit, Mich. Secretary, W. L. Miller, City Manager, St. Augustine, Fla.

Nov. 21-24.—National Municipal League.—Twenty-third annual meeting, Hotel Statler, Detroit, Mich. Secretary, Clinton R. Woodruff, 703 North American Building, Philadelphia, Pa.

Dec. 4-6.—American Association of State Highway Officials.—Annual meeting, Hotel Jefferson, Richmond, Va. Acting Secretary, H. M. Berry, Chapel Hill, N. C.

Jan. 15-17, 1918.—Virginia Good Roads Association.—Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

League of Kansas Municipalities

The ninth annual convention of the League of Kansas Municipalities will be held at Wichita, Kan., on Oct. 16-19. In conjunction therewith the Kansas City Planning Conference will hold a meeting for the consideration and discussion of needed city planning legislation in the state. A number of municipal problems will be discussed. In addition, the various departments of the League will hold separate group conferences.

Among the addresses to be delivered will be the following: "Public Improvements During War Time," James L. Beggs, Commissioner of Streets, Kansas City; "Kansas City's Park and Boulevard System," illustrated, W. H. Dunn, Superintendent of Parks, Kansas City, Mo.; "The Next Step in City Planning in Kansas," W. C. McNown, Instructor in City Planning, University of Kansas.

League of California Municipalities

Several hundred delegates were in attendance at the opening of the annual convention of the League of California Municipalities, at Santa Rosa, Cal., Sept. 25. Mayor James Mailer, of Santa Rosa, made the address of welcome. Governor Stephens, who was unable to be present, was represented by John Mitchell, State Equalizer.

Max Thelen, President of the California Railroad Commission, was one of the principal speakers, his subject being "Railroad Grade Crossings Within Municipalities." Mr. Thelen stated that up to June 30, 1917, the commission which started an investigation early in 1916, had inspected 5,300 crossings and had made 3,000 recommendations for greater safety, and that over one-half of these recommendations had already been carried into effect by the railroads and local public authorities.

The convention closed on Sept. 28. The program was printed at some length in the issue of Sept. 15. It covered the subject of city planning as well as a wide range of municipal subjects.

Southern Commercial Congress

As announced in the issue of last week, the Southern Commercial Congress will open at the Hotel Astor, New York City, today and will continue during the week of the 14th.

The sessions in which road builders are more especially concerned will take place at 10:00 a. m. and 2:30 p. m., Tuesday, at the Hotel Astor. The program of those sessions is, in part, as follows:

Morning session: Introductory address by William F. McCombs, Chairman, New York Good Roads Committee; Addresses by Henry B. Varner, Editor, "Southern Good Roads;" Gen. T. Coleman Dupont; Geo. C. Deihl, Chairman, Good Roads Board, American Automobile Association.

Afternoon session; Good Roads Conference: Presiding officer, William F McCombs. Addresses by T. E. Patterson, Chairman, State Highway Department of Georgia; Rodman Wiley, Commissioner of Public Roads of Kentucky; W. S. Fallis, State Highway Engineer of North Carolina; Xavier A. Kramer, State Highway Engineer of Mississippi; H. G. Shirley, Chief Engineer, Maryland State Roads Commission.

Washington State Good Roads Association

The inspection of sixty miles of improved roads in Whatcom County by about three hundred delegates was a feature of the first day's session of the annual convention of the Washington State Good Roads Association which met at Bellingham during the last week of September. The program of the meeting was printed in detail in the issue of Sept. 22.

President Robert L. Sparger, in his annual address, advocated the improvement of military highways as a first aid to the government. Among other recommendations, he urged the preservation of forests along main highways, particularly those lying outside the boundaries of the national forests, and suggested that a sufficient strip be set aside along the roads to provide for comfort stations and camp fire locations, under the jurisdiction of the state, as a part of the state park system. He also advocated the planting of trees along state and county roads in prairie sections.

Among those who led the discussions of various road themes were Samuel Hill, Honorary Life President of the Association; James Allen, State Highway Commissioner of Washington; I. M. Howell, Secretary of State, and R. H. Thomson, civil engineer, of Seattle.

The Committee on Resolutions presented the following report, which was adopted:

> We beg to point out the need of serious thought on the part of the membership of the Washington State Good Roads Association on road matters in general, and those in particular having to do with construction of surfaced roads, rather than to get together annually and discuss in a general way the benefits accruing from a final completion of the system of roads.
>
> We believe the causes of mistakes in one county should be carefully investigated and these causes passed on to each of the other counties of the state for their benefit.
>
> We also believe that thoroughly demonstrated successes in each of the counties should be called to the attention of every other county and the method employed to bring about the successful results clearly outlined for the use of the other counties.

(Continued on page 202.)

EQUIPMENT — TRADE — MATERIALS

Duplex Output to be Increased.

The Duplex Truck Co. of Lansing, Mich., expects to increase its output of heavy haulage trucks to about 300 monthly during 1918, according to a recent statement by Geo. W. Hewitt, Secretary and Treasurer.

Two new factory buildings that will give about 100,000 sq. ft. of additional floor space are being built and will be completed in November. Both buildings are two-story structures, one being 402x72 ft. and the other 306x72 ft. The machinery will be installed by the first of the year.

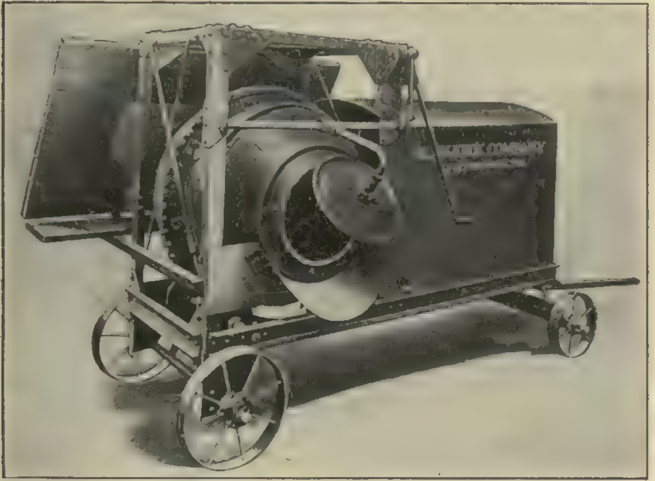
The value of the trucks manufactured in 1918 is expected to reach a total of $12,960,000, about ten times the value of the company's 1917 production.

New Concrete Mixer

A concrete mixer that is new to the market is shown in the accompanying illustration.

The sills of the frame are 4-in., 6¼-lb. channels, and the over-frame is of 3x3x3/16-in. angles. It is braced at each end by adjustable tie-rods. The rollers are of the solid web and hub type. They run loose on 1¾-in. shafts and are lubricated by means of grease cups. The traction rings are of rolled steel, riveted to the shell, welded and turned.

The main drive sprocket is cast in segments and fastened to angle lugs riveted to the drum. The mixer is driven by a Novo gasoline engine of 4 hp. for the low charge type mixer and 6 hp. for the model equipped with a power loader. The chain is of the roller type, with case hardened pins and bushings



LOW CHARGING TYPE "RANSOMIXER."

The drum is provided with cone-shaped ends and straight blades undercut in the direction of revolution and so set that the discharge from one blade falls on the back of the blade following.

The machine is known as the "Blaw-Ransomixer," and was designed by A. W. Ransome, Manager and Chief Engineer of the Blaw-Knox Company of Pittsburgh, Pa., the manufacturer of the mixer.

Standard Asphalt & Refining Company Purchases Sarco Petroleum Products Company

The Standard Asphalt & Refining Company of Chicago, Ill., has announced its purchase of the plants, trade marks and good will of the Sarco Petroleum Products Company. The Cities Service Company of New York, N. Y., is announced as the new interest back of the company, although the management remains essentially the same as it was before the change.

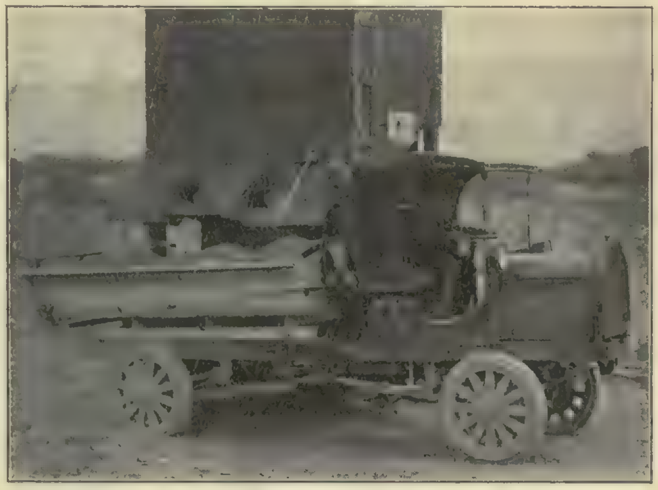
Charles Muller, an executive of the former company, has been made manager of the new firm, and Robert F. Trumbull has been promoted to the position of manager of the railway and building materials department.

It is stated that the new company will be much more active than the old one and that its facilities will be greatly increased by its relations with the Cities Service Company.

Gravel Hauling Costs Reduced by Use of Motor Trucks

The cost of hauling gravel for city street work has been reduced by nearly one-half through the use of motor trucks, according to W. C. Hill, Superintendent of Public Works, of Lansing, Mich. One of the city's Duplex trucks is shown in the accompanying illustration.

The cost of hauling gravel from the pit to the work in wagons was $1.75 per cu. yd., while with the trucks it has been cut to 90 ct., it is stated by Superintendent Hill. He also states that replacing teams by trucks has materially shortened the time it takes to do street work. Further reductions in cost are anticipated from the proposed use of trailers in connection with the trucks, and it is expected that one year's savings in hauling cost will pay for the trucks purchased.



DUPLEX TRUCK USED TO HAUL GRAVEL.

In discussing the results of the city's use of the trucks, Superintendent Hill says in part:

"Motor trucks are dependable—on the job in all kinds of weather and with sufficient power to haul capacity loads up grades and over soft, newly made roads—are money savers and money makers for any city.

"Our road building work is being carried on much more efficiently with motor trucks, and we are accomplishing twice as much as we did under former conditions with teams and wagons."

The Blaw-Knox Company, of Pittsburgh, Pa., announces that, owing to conditions created by the war which have called to service many of the salesmen and engineers of the company, it has decided to close the Boston office for the duration of the war. All inquiries and all work in the Boston territory will be handled through the New York office, 165

Broadway. Friends and customers are requested to bear with the situation until the war is over, as it is not the intention of the company to replace any of the men who are giving their service to the country.

The Asbestos Protected Metal Co., of Pittsburgh, Pa., announces the appointment of Ole H. Olsen, 822 Perdido St., New Orleans, La., as Sales Agent for the State of Louisiana and the southern portion of Mississippi.

"The Giant Laborer" is the title of a booklet recently issued by E. I. du Pont de Nemours & Co., of Wilmington, Del., in which various uses of explosives are described and illustrated. Among these is the utilization of explosives in road work. The booklet is 6x9 in. in size and consists of 152 pages and covers. It is fully illustrated by halftones, diagrams and drawings.

MEETINGS

(*Continued from page 200.*)

We further recommend:

1.—That the office of the county engineer be made appointive by the county commissioners.

2.—That during the process of construction of all permanent highways continuous inspection be had under the jurisdiction of the State Highway Department.

3.—That a uniform system of cost accounting of both construction and maintenance of all roads be established.

4.—That a cross-state highway be completed as soon as possible.

5.—That no more roads be added to the present state system until the mileage now designated by law shall have been fully completed.

6.—We believe that the state should actively cooperate with the federal government in the construction of such military highways as may be necessary for the proper protection of our coasts.

7.—We desire to express to the Chamber of Commerce of Bellingham, to the local citizens and good roads enthusiasts, and particularly to the efficient reception committees our great appreciation for the entertainment offered us and to assure them that our stay in this city has been both pleasant and profitable and that we shall long remember the Bellingham meeting of 1917.

On Friday the convention unanimously adopted the following resolution:

BE IT RESOLVED by the Washington State Good Roads Association in eighteenth annual convention assembled: That in common with the other nations of the civilized world, the United States faces a danger which threatens her existence as an independent nation of freemen. This danger menaces from both within and without.

Until this menace is removed no other matter deserves our serious consideration. This danger can be met and overcome only by united practice of two things:

1. All citizens must become obedient to law, and
2. There must be collective coordination of our community and private forces and resources, together with the forces and resources of the nation.

There is but one country and one flag and everyone who is not definitely for us is against us.

As citizens of this republic we do solemly pledge ourselves and all we have to the service of our country, and we denounce as traitors to country and flag everyone whether rich or poor who does not stand ready to so serve

We brand every attempt to extort money from our country or its citizens by reason of the opportunity afforded by our present necessities, through profiteering or by strikes as being selfish, dishonest and traitorous.

For ourselves we declare all differences at an end and we do again pledge our organization and our individual efforts unsparingly and unselfishly to the service of our country.

Respectfully submitted,

SAMUEL HILL,
R. H. THOMPSON,
A. L. ROGERS,
ELI. ROCKEY,
J. J. DONOVAN.

The convention closed with the election of officers and the selection of Pasco, Wash., as the place of the next annual meeting, the date to be decided by the president. The officers are as follows:

President, Arthur D. Jones, Spokane; Vice Presidents, Frank Terrace, King; F. C. Shultz, Chelan; Oliver Hall, Whitman; E. M. Gillette, Chelan; F. A. Fontaine, Columbia; Treasurer, Percy L. Sinclair, Pacific; Secretary, Clancey M. Lewis, Seattle.

Executive Committee: John P. Hartman, King, Chairman; Frank W. Guilbert, Spokane; E. C. Burlingame, Walla Walla; Hans Munn, Jr., Snohomish; W. B. Coffman, Lewis; Lee Monohan, King; Torger Peterson, Pierce; J. J. Donovan, Whatcom; Henry Parry, King; James Leslie, Yakima; J. E. Calder, Grays Harbor; F. J. Wilmer, Whitman; Fred L. Wolf, Pend Oreille; J. C. Hubbell, Kittitas; J. G. Kulzer, Stevens; J. T. Cull, Grant; W. H. Reed, Pierce; F. Garret Fisher, Pierce.

Legislative Committee: C. L. Morris, King, Chairman; Eli Rockey, Pacific; W. A. Bolinger, Okanogan; L. H. Brown, Spokane; C. L. MacKenzie, Whitman.

Lackawanna County Good Roads Association

A number of citizens of Lackawanna County, Pennsylvania, met on Sept. 11 and organized the Lackawanna County Good Road Association with the object of securing the improvement of the highways of the county.

The executive officers and directors of the new association are as follows:

President, John R. Williams; First Vice President, Frank Northrup; Second Vice President, Thos. W. Bates; Treasurer, J. H. Richards; Secretary, R. Leo Huber.

Directors: Walter S Buck, Willis Kemmerer, George B. Jermyn, A. J. Casey, P. F. Cusick, S. R. Bliss, Ed. Kolb, Wallace Ruth, D. R. Morgan and Harry A. Smith, of Scranton; Ed. C. Ely, Carbondale; M. J. Walsh, Mayfield; A. F. Gebhardt, Jermyn; L. S. Parsons, Archbald; Dr. Thomas Monie, Archbald; John S. Reese, Peckville; Dr. E. L. Van Sickle, Olyphant; Wm. Shurtleff, Clarks Summit; Wm. Widowfield, Clarks Green; Russell Porter, Elmhurst; J. E. Loveland, Moscow; James Timlin, Taylor; John Corcoran, Old Forge; Charles Belin, Waverly, and Mortimer B. Fuller, Dalton.

The office of the secretary is at Scranton, Pa. D. L. Morgan, of Scranton, is Chairman of the Goods Roads Committee.

PERSONAL NOTES

Robert W. Davis has resigned as Road Engineer of Fayette County, Kentucky.

W. C. Bickford, County Engineer of Snohomish County, Wash., has received a commission in the U. S. Coast Artillery.

Robert A. Hamilton, Assistant State Engineer of Idaho, has been commissioned a lieutenant in the Engineers' Reserve Corps.

F. R. Demarest, recently connected with the Turner Construction Co., of New York City, is now directly supervising concrete highways and railroads in connection with the Aviation Experiment Station, Langley Field, Hampton, Va.

George S. Eaton, Assistant Professor of Civil Engineering, Clemson Agricultural College South Carolina, is now with the Universal Portland Cement Co., Chicago, Ill. His work is in connection with the pavement division of the promotion and inspection bureau.

E. R. Kinsey, President of the Board of Public Service, St. Louis, Mo., recently made an automobile inspection trip covering 187 mi. of concrete roads in Michigan and Wisconsin, looking toward the building of the proposed new highways in St. Louis County, Missouri.

GOOD ROADS

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Old Series, Vol. LII.
New Series, Vol. XIV.

NEW YORK, OCTOBER 20, 1917

Number 16

Use of Light Canvas Strip for Floating Concrete Pavement

By **CHARLES T. FISHER***

On the Jamestown-Bemus Point State Highway, Chautauqua County, New York, a piece of 10-oz. canvas, 3 ft. wide and about 3 ft. longer than the width of the pavement, folded in at each edge, is used instead of the heavier belts usually employed in the so-called belt method of finishing concrete pavement

The concrete is struck off with a heavy screed of the ordinary type immediately after placing and an excellent finish is obtained by going over the surface once with the canvas. It is rarely necessary to use a hand float. Difficulties in finishing at the joints are avoided by placing the tops of the wood joint-strips 1½ in. beneath the surface. The final finish is obtained by light brooming.

The pavement is laid as a single course of 1:1½:3 concrete, the coarse aggregate being 1½-in. to 2½-in. limestone. Stone and sand are well graded and a fairly dry mixture used. A dry mixture is necessary for the best results in floating with the canvas strip.

Canvas Strip Used for Floating the Concrete Pavement.

Workmen Floating Completed Pavement with Canvas Strip.

METHOD OF FLOATING CONCRETE ON THE JAMESTOWN- BEMUS POINT STATE HIGHWAY, CHAUTAUQUA COUNTY, NEW YORK

If the screeding is carefully done, the canvas produces a smoother surface than can be obtained with a float, and less mortar is brought to the top. Time is saved, as the concrete may be finished immediately after screeding. No skilled labor is required. The light canvas does not alter the shape left by the screed, and it is only necessary to make sure that it always touches the tops of the forms as it is worked back and forth along the surface.

The canvas strips have all the advantages of the heavier belts. In addition, the folded edges have no tendency to dig into the soft concrete, the strips are lighter and more easily handled than belts, are less expensive, and produce better results.

Lawrence Schultz, Fredonia, N. Y., is the contractor and John A. Wallace, Engineer for the State Highway Department. The writer is in charge of state road construction in Chautauqua County.

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*Senior Assistant Engineer, New York State Highway Department, Jamestown, N. Y.

Shale Cube Pavement on Stutson Street, Rochester, New York

By **GEORGE C. WRIGHT***

In the accompanying illustration [see next page] is shown the latest pavement laid with McClintock cubes. These cubes are made of vitrified shale, are 2¼ in. square, and are laid on a base of macadam, 5 in. thick. A complete description of this type of pavement was printed early this year. ["Resurfacing Old Macadam Roadways with Shale Cubes," by J. Y. McClintock, "Good Roads," Feb. 3, 1917, page 74.]

Stutson Street is the west approach to a bridge just being completed across the Genesee River in Rochester, N. Y. The bridge has a two-leaf bascule draw span, with 150 ft. clear width of channel. The approach on the west has a span over the New York Central Railroad about 100 ft. long and the east has a trestle approach about 600 ft. long. On the bascule span, the floor is being made of plank of double thickness; on the rest of the bridge, the fixed portion, there is being laid a pavement of vitrified shale cubes on concrete.

About a dozen pieces of this pavement have been laid, beginning in 1908. On bridges, they are placed on concrete floors. On heavily traveled highways, they are laid, in some cases, on a concrete base and in others on macadam 5 in. thick. All of the pieces laid are in good condition.

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*Assistant County Superintendent, Monroe County, New York.

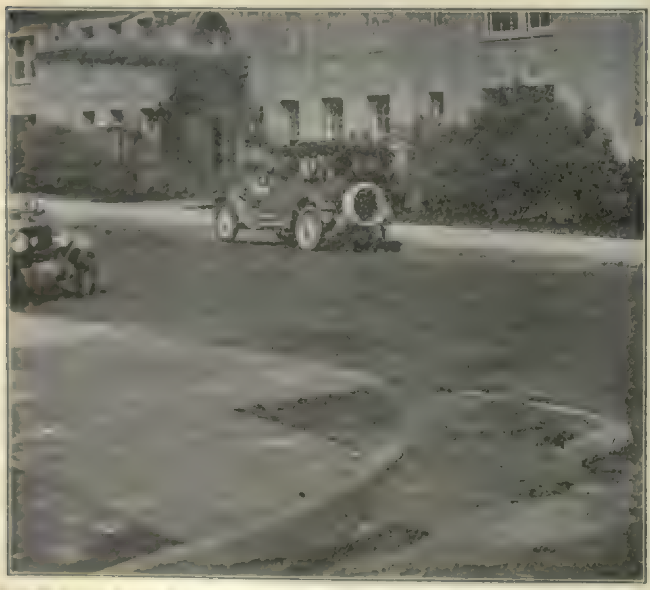
McCLINTOCK CUBE PAVEMENT ON THE STUTSON STREET APPROACH TO THE CHARLOTTE STREET BRIDGE, ROCHESTER, N. Y.—PAVEMENT LAID ON 5 IN. OF BROKEN STONE.

It was planned to lay these cubes this year on 4 mi. of highway being built with the money received by the county from motor vehicle licenses, and also on a state-county highway. In the case of the state-county highway, however, two successive advertisements failed to secure bids, and in the case of the other two roads, although the grading was done and the bottom course put in, on account of difficulties of transportation and labor, it was impossible to get the cubes.

Long Radius Curves for Curbs at Busy Street Intersections

The use of curves of long radius to facilitate and safeguard traffic at street corners has been noted previously in these columns. A recent installation of this kind is shown in the accompanying illustration in which the old curb intersection can also be seen.

The photograph was taken at the junction of Lake Shore Drive and Division Street, Chicago, Ill. The old curb at the corner was built with a curve of 1½ ft. radius. The concrete curb recently put in curves around the corner with a radius of about 14 ft.

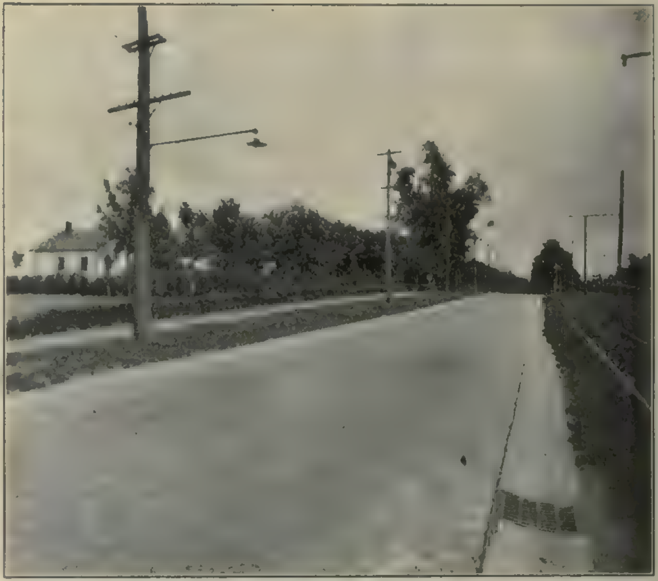


SHORT RADIUS CURB REPLACED BY ONE OF LONG RADIUS TO SAFEGUARD AND FACILITATE TRAFFIC—LAKE SHORE DRIVE AND DIVISION ST., CHICAGO, ILL.

Vitrified Pipe Underdrain and Concrete Gutter Replace Open Ditch

Safety has become one of the chief requirements of the modern road since the advent of the motor-driven vehicle, with its comparatively great weight and its high speed. This has been very generally recognized, and various means have been employed to safeguard traffic of all kinds. Warning signs, laws and ordinances regulating the use of roads and streets, and educational campaigns have been included. Road builders have also recognized the necessity for making roads safe and have taken the element of safety into account when designing and laying out roads and streets.

An example of "safety built into the road" is shown in the accompanying view on the Cleveland-Buffalo Road near the former city. This highway carries a very heavy traffic of both pleasure cars and motor trucks. In spite of this, it is reported, the number of accidents on it has been surprisingly small. This is attributed to the side drainage by means of vitrified pipe drains and concrete gutters which discharge to the pipes at short intervals. The design was made by H. P. Cumings, formerly county surveyor of Lake County and now highway engineer of the Cleveland Civic League.



CONCRETE GUTTERS AND VITRIFIED PIPE UNDERDRAINS USED INSTEAD OF OPEN DITCHES ON A BRICK PAVED OHIO ROAD—THE BUFFALO-CLEVELAND ROAD, NEAR CLEVELAND.

The pavement is of vitrified brick and 18 ft. in width. At each side is a shallow 2-ft. concrete gutter, which also serves as a curb. The inner edge of the gutter is flush with the pavement, the outer edge is 1 in. above the edge of the paving and the greatest depression below the inner edge is 1½ in. The drains were generally laid a few feet outside of the gutters and were connected with them every 400 or 600 ft. Where the drains were in danger from tree roots and where underdrainage was not required, the joints were filled with cement. At other parts of the line about a quarter of the joint was left open, an unfilled section being left at each side of the bottom section, which was filled.

This arrangement gives an automobile 2 ft. of additional room on each side before it gets into the soft shoulder, thus giving an effective paved width of 22 ft. instead of 18 ft. In addition, there is no projecting curb against which a car can be crowded.

Highway Problems in New York State—III*

By H. ELTINGE BREED†

Widths and Treatment of Curves

Most of the roads we have been building in New York State are 16 ft. in width. This is because when the money was appropriated to build our system, it was on the basis of approximately $13,000 per mi. That was a low figure even at the time, in 1912; at present it is obviously impossible to complete the system as planned then. Only by the strictest economy, by substituting different classes of pavement within certain limits of cost, and by federal aid can we expect to have all of our important roads brought together into a good highway system. It would be far better, however, and ultimately more economical, if we had sufficient funds to build them 18 ft. in width.

For two lines of traffic on a concrete road, 18 ft. should be the minimum width; for three lines, 24 ft.

The use of motor vehicles is steadily increasing; they are being built wider and wider. Hence they require pavements where vehicles at least 90 in. wide can constantly and comfortably pass one another, and 18 ft. is probably the narrowest width to allow this. Especially is this true of concrete roads, because the transition from the hard concrete surface to the earth shoulder and back again becomes really dangerous in some soils on account of the rut that traffic usually wears along the joining line.

In order to obviate the danger of accidents on our 16-ft. roads, we have been widening or mooning out the curves, so that in some cases for those of small radius at the center the actual curve is as much as 22 to 24 ft. wide. We have also considered it good practice to give the outside of these curves a superelevation in order to make easier the steering of a car, to lessen the likelihood of skidding, and to insure greater safety in taking these curves at speed. This has been objected to as inducing people to travel around these curves at high speed, but speeding seems to be an inherent mania, unrelated to external conditions, and certain it is that banked curves lessen the casualties resulting from it.

Planning and Completion of Our System of Roads

On Jan. 1, 1917, there were 6,474 mi. of pavement actually completed and accepted by the department, and at that time there were 1,435 mi. of work under contract, of which possibly half was completed. This would make a completed mileage of 7,100. From the records we have, it would seem that the towns and counties have built about an equal amount of mileage, which, while not of as good a type of construction in many cases as that done by the state, is at all times usable and of a good quality of improved road. This would make a total of 14,000 mi. of improved roads in the state today. As there are still about to be built 3,000 mi. of our system, and as it is safe to assume that the counties in the same time will build an equal amount, it is safe to say that when our bond money is exhausted we shall have 20,000 mi. of improved roads in the state. As only about half of the total of 80,000 mi. of roads in the state are of importance—say, 40,000 mi.—we can safely assume that when this work is completed, we shall have about 50% of the necessary roads in the state improved ready for service.

With a few exceptions, you can go all over the main thoroughfares of this state today on macadam or improved roads. From the west you can come in from the Pennsylvania line and go along the whole southern tier, across Delaware and Sullivan Counties with the exception of 6 mi. which will be done this year, and Orange County to New York; you can travel the whole length of Long Island, or soon will be able to do so; go up the Hudson River to the Canadian line; follow the river line of the St. Lawrence and Lake Ontario back to Buffalo; and thus, practically by unbroken highways within our state, bound our state. And that without saying anything of the fast-growing web which connects the interior of the state. When you begin to realize what wonderful opportunities it affords, isn't there good cause for thinking that the State of New York is really the most interesting state of the Union? Anyway, it has scenery of unrivaled importance, and places that teem with historic interest such as this section of the Hudson and Mohawk River country which is as well known to the schoolboys of California and Texas as to the children of our own state. All of these things are now entirely accessible by means of improved highways at all times that people wish to travel.

Our general scheme at present to complete our important systems is to give the taxpayers every mile of road possible by the expenditure of the money available by the bond issue. This work will be amplified by the use of federal aid for the most important links that cannot be taken care of in any other manner, and are in communities where the taxpayers themselves could not afford to improve these roads. There will also be surplus moneys in certain counties whose systems will be complete that by legislative enactment may be made available to piece out the most important parts of our state system.

In order to further the system and get greater mileage, there is an amendment to the highway law which passed last year giving counties the right to pay 50% of the cost of a county highway instead of 35%, as before. Several of the counties already have met us in this way, and many more are to lay the proposition before their boards of supervisors at the next meeting. These are the only means in our hands for the completion of the original system as planned and owing to the increased cost of construction and the necessity for building more durable types of pavement to meet existing conditions, there will still be some important highways left that we shall not be able to build without further funds. In order to get these roads improved, we have been asking the cooperation of the counties in building these sections from county funds alone.

Extraordinary care is being taken to see that the above schemes as outlined dovetail to the best advantage. Commissioner Duffey is in constant touch with the various boards, cooperating with their various systems. The inserting of a piece of federal aid here and a piece of state road there and a piece of road by county funds alone will bind these three classes together as a completed unit that will give us the much coveted completed system.

So far the various boards of supervisors have generally shown a disposition to meet the commissioner half way or better in an effort to revise the county systems so that the most important connections can be built first, with the less important roads later.

Keeping of Statistics

The necessity for uniformity in highway statistics and data cannot be too strongly emphasized. In spite of the fact that much has been written on the subject, it has nevertheless been considered of relatively minor importance not only by the general public, but even by the engineering profession. This may be accounted for by the tremendously rapid development of highways during the past twenty years, which has kept engineers too absorbed in the process and problems of daily construction work to allow them much time for formulation and correlation of a great mass of statistical material. The hour has struck, however, when continued neglect of this important branch of our subject will mean waste of experience, energy and resources.

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*Part of a paper read before the Albany Society of Engineers, Albany, N. Y., April 24, 1917. The previous instalments of this paper were printed in Good Roads for Oct. 6 and Oct. 13; another instalment will appear in a later issue.

†First Deputy Commissioner, New York State Commission of Highways.

We have tried to record all the important facts which form such statistics and data as shall be of permanent value to the engineering profession and to all those interested in the constructing and maintaining of highways and the enacting of laws concerning them.

The necessity for uniformity is obvious. Under the present system, many different highway departments throughout the various states are doing similar work without any basis for comparison. The records of one are unintelligible to others. Mistakes made in one department are duplicated by many another. Experiments are repeated, often with unsatisfactory or disastrous results, in a dozen different places. Every department, every engineer, has to learn largely through his own experience, and when this process involves the huge sums now being expended upon highways, it is entirely too costly. Were comparative statistics available, every department would be an experiment station, every experiment an illumination to the whole field. The conscientious engineer, consulting such statistics upon the inception of any new work, could determine, far more accurately than he can today, factors making for success or failure in it.

Granted the necessity of having a uniform system for keeping statistics and data, we must consider its scope. The speaker believes that it should be broad and comprehensive enough to be of relative worth, without tying itself up into an agglomeration of red-taped detail. Simplicity should be its key-note and motif. It should be devised in such a way as to be intelligible to anyone without the department who came thither for information, and it should give to all employees within the department adequate knowledge of the work, its preliminaries, its progress and its results. In such a system, only approximate cost data could be sought, for varying local conditions would so change many items as to make them inconclusive.

Construction and Maintenance Data

As this is one of the most important items in the consideration of uniformity, I shall endeavor to give a description of any such data as are needed, chiefly for the purpose of emphasizing the necessity for uniformity and for the keeping of this kind of statistics. Probably every municipality and state engaging in the improvement of highways and pavements has some form or other which covers this class of data and some effort should be made to reduce the ultimate results to standardized units flexible enough to cover all constructive and maintenance matter and relative enough to permit an intelligible exchange of these data between different departments. These statistics are outlined with the idea of placing in the hands of the designing engineer a rough relative cost of the types of pavement, giving the kind of material used, the density of traffic carried, its growth invited by the improvement, and the life of the pavement, so that he can in the consideration of a new problem have always before him a service test of magnitude equal to that of the undertaking to be considered. This information should also be of equal value to the maintenance engineer as a record of the results gained from the expenditure of money from year to year on different types, giving him adequate data on which to formulate new kinds of treatment along lines giving the greatest satisfaction, and to discard methods proven by use to be unreliable.

New Highway Legislation in Arkansas

The principal road legislation enacted by the Arkansas Legislature at the 1917 session was a law accepting the aid provided by the federal aid road law, and making regulations for the use of money received from that source. The law follows:

Section 1. That the Advisory Board of the State Highway Commission is hereby created for a period of 20 years, which Advisory Board shall consist of the engineer of the State Highway Department, the consulting engineer of the State Highway Department, and one member to be appointed by the Governor for a term of two years.

Section 2. The Advisory Board shall hold regular meetings the last day of each month, and the secretary of the State Highway Commission shall meet with said board and keep the minutes of the meetings of the board; provided, however, that any two members shall have the right to call a special meeting at any time they shall deem it necessary.

Section 3. All members of said board shall be entitled to the necessary traveling expenses to attend any board meeting, and the consulting engineer of the State Highway Department and the member of the board appointed by the Governor shall, in addition to their traveling expenses, receive the sum of $5 per day for each day they attend the board meetings; the traveling expenses and per diem provided for herein shall be paid out of the highway improvement fund in the manner provided in Section 9, of Act 302 of the Acts of 1913.

Section 4. For the purpose of this act, and for the purpose of creating a uniform system of state aid, public roads which lead from one county seat in one county to another county seat in another county; or from one county seat in one county to another county seat in the same county, or from a county seat along highways leading into other states, or any other rural post roads, within or without an improvement district, are designated as state roads, excluding every street or road within the corporate limits of any city of the first or second class.

Section 5. That Section 24, of Act 302 of the Acts of 1913, is hereby amended so as to read as follows:

"The tax collector shall collect the sum of $10 from the owner of every motor vehicle defined in Act 134, approved March 24, 1911, which shall be paid quarterly into the state treasury and credited to the highway improvement fund. The tax collector shall be allowed 25 ct. as a fee for each license fee collected by him, the same to be paid out of the highway improvement fund. In addition thereto, he shall charge every delinquent owner of every motor vehicle a penalty of $3—one-half of which shall go to the collector and one-half to the highway improvement fund.

"In case of seizure or sale of any such vehicle, the collector shall have the same fee and pay as may be allowed for the seizure and sale of other personal property for taxes, provided, any person aggrieved by the action of the collector, may pay the tax and charges under protest, and the county court shall have the power, after proper hearing, to order the return of same if found that the collection thereof was unjust or improper."

Section 6. Whenever any county or any subdivision thereof, or any duly and legally organized improvement district, contemplates building, constructing or improving a state road with a view of securing state or federal aid, or both, for any county or any subdivision thereof, or any road district, the county judge, or the commissioners for the road district, as the case may be, shall make application to the State Highway Commission for state or federal aid, or both, whereupon the State Highway Commission shall direct the state highway engineer to make or cause to be made the necessary survey, plans, specifications, estimates of cost of said road or roads, and if said application is made in conformity with the regulations prescribed by the State Highway Commission, the said commission shall refer the matter to the Advisory Board, which, after examination of the preliminary plans and specifications and estimates of cost, if it shall conclude to recommend aid to the county or subdivision thereof, or the road district, the said Advisory Board shall name the amount in their recommendation to the highway commission and furnish a copy of said recommendation to the county judge or the commissioners of the road improvement district, provided, that the State Highway Commission is not permitted under this act to render state or federal aid to any county or subdivision thereof, or any improvement district, except on the recommendation of said Advisory Board; provided, further, that when application for federal aid has been made by the highway department if the Secretary of Agriculture of the United States should refuse to grant federal aid to the said road, then the Advisory Board may withdraw their recommendation for said aid; provided, further, that the said Advisory Board shall approve only such projects as may be substantial in character, and the expenditures of funds hereby authorized shall be applied only to such improvements. Items included for engineering, inspection and unforeseen contingencies, shall not exceed 10% of the actual estimated cost of the improvement; provided, further, that when the Advisory Board finally approves said application, it shall notify the highway commission, which commission shall, as soon as practicable, pass on the application, and at the recommendation of the Advisory Board, if adopted by the highway commission, the county judge, or the commissioners of the road improvement district shall be notified, and the said highway commission shall immediately certify to the treasurer of the State of Arkansas the amount allowed by the highway commission for each particular road or road improvement district, and the treasurer of the State of Arkansas shall then set aside the share of the state out of the highway fund payable under this act on account of such project, which shall not exceed 50% of the actual estimated cost thereof. No payment of any money apportioned under this act shall be made on any project until such statement of the project and plans, specifications and estimates of cost thereof shall have been prepared or approved by the highway commission.

Section 7. The commissioner of the State Lands, Highways and Improvements is hereby designated as the proper officer to receive payments as they shall be made by the secretary of the treasury of the United States; said commissioner shall keep a separate set of books showing all such payments made by the United States and the road or road improvement district to which it is to be applied, showing all disbursements of moneys so received from the United States Government. The moneys shall be paid out of this fund received from the United States in accordance with the regulations prescribed by the proper authorities of the United States Government. And, provided, further, the State Highway Commission is authorized for and on behalf of the county judge to enter into all necessary agreements with the Department of Agriculture of the United States, for carrying out the provisions of this act as is required by the rules and regulations of the secretary of agriculture in granting aid to any county, subdivision of a county or road improvement district for the buildng of rural post roads.

Section 8. When the highway commission shall find that any project so approved has been constructed in compliance with said plans and specifications, it shall cause to be paid to the proper authorities of the road improvement district the amount set aside by the state and by the United States for said project. All moneys paid out by the treasurer of the state in aid of any state road shall be paid on warrants of the state auditor, in compliance with Section 9, Act 302 of the Acts of 1913, provided, that the State Highway Commission may, in its discretion, from time to time, make payments on said construction or improvement, as the same progresses; but these payments, including previous payments, if any, shall not be more than the state's proportionate part of the value of the labor and material which have been actually put into said construction in conformity to the plans and specifications; nor shall any payment be in excess of $10,000 per mi., exclusive of the cost of bridges of more than 20 ft. clear span. Provided, however, that the highway commission shall have the right to refuse to make any payment, either of the state or federal money, to any county or subdivision thereof, or to any road improvement district, when the work being done is not in compliance with the plans and specifications.

Section 9. No state or federal aid shall be given to any road constructed by a county or any subdivision thereof unless the county court set aside the 3-mill road tax, collected within a distance not exceeding 3 mi. from the road constructed, or so much thereof as may be necessary to properly maintain such road to the satisfaction of the State Highway Department and the federal government, or unless the county judge makes other satisfactory orders and provisions for the proper maintenance of roads receiving state or federal aid. No state or federal aid shall be given to any road improvement district unless the commissioners of the said district levy a sufficient yearly tax to properly maintain the road or roads constructed by said district, or unless the county court set aside the 3-mill tax or a sufficient amount thereof to properly maintain such road or roads to the satisfaction of the State Highway Commission.

Before any state or federal money is advanced to any county or subdivision thereof, the county judge shall send to the highway commission plans, specifications, estimates of costs and copies of all court orders relating thereto, together with such other information as the highway commission may require, and when said county or subdivison thereof shall have complied with the requirements and rules of the secretary of agriculture of the United States, and the State Highway Commission for the granting of state and federal aid for the building and maintaining rural post roads, the State Highway Commission shall have placed to the credit of said county or subdivision thereof, the amount of state and federal aid granted to said county or subdivision thereof, to be paid out on warrants as provided in this act and the rules of the secretary of agriculture and the State Highway Commission.

Section 10. The Department of State Lands, Highways and Improvements shall have the right to pay the proportion of the aid granted by the state to any road district by labor of able-bodied state convicts whenever the convicts are not otherwise employed by the penitentiary authorities. State convicts worked on said road shall be under the care and custody of wardens or other officers named by the penitentiary authorities, with the approval of the governor, but the Department of State Lands, Highways and Improvements shall determine the work to be done by such convicts, the time, place and manner of such work, the number of convicts to be worked, and the work shall be under the direct supervision of the State Highway Department. The pay of the wardens, and the cost of maintenance, including clothing, food and housing for the state convicts while working on said roads, shall be paid out of the highway improvement fund. The penitentiary authorites are to receve no profits for working the convicts on state roads. The highway department shall determine the number of the convicts needed, and shall prescribe the rules and regulations under which they shall work.

Section 11. The Department of State Lands, Highways and Improvements shall be allowed to employ the following additional assistants and clerks:

One first and second assistant highway engineer at a salary not exceeding $1,800 and $1,200, respectively, per year. These assistant engineers shall be appointed by the commissioner of state lands, highways and improvements upon the recommendation of the state highway engineer, subject to the approval of the State Highway Commission, and they may be required to perform such duties as may be required by the highway commission.

One accountant, to be appointed by the commissioner of state lands, highways and improvements, subject to approval of the State Highway Commission; said accountant to receive a salary not exceeding $1,500 per year, and he shall serve in the capacity of accountant of the highway commission and perform such other duties in the department as said highway commission may require.

One clerk, when needed, may be appointed by the highway engineer, with the approval of the highway commission; said clerk to receive a salary not exceeding $1,200 per year, and he shall perform such duties as the highway engineer may require.

Section 12. Before any state or federal money is advanced to any road improvement district, the county judge or commissioners shall send to the highway commission a certified copy of the petition of the landowners, a plat showing the boundaries of the district, proof of publication of notice, order establishing the district, oath of the commissioners, plans and specifications, estimates of cost, publication of assessments, benefits and damages, all court orders, together with such other information as the highway commission may require.

The highway commission shall present the same to some attorney for examination. The attorney shall be selected by the highway commission, with the approval of the governor. If, upon examination by the attorney, the district is found to be created in conformity with the constitution and laws of the State of Arkansas, such facts shall be certified to the highway commission. All attorney fees shall be paid by road improvement districts, in accordance with a rate prescribed by the highway commission, not to exceed one-half of 1% of the cost of the improvement. Provided, when the attorney so selected approves the validity of the road improvement district and such opinion is filed in the office of the highway commission, such improvement district shall be prima facie legal, unless suit be brought within ten days contesting the validity of the district, and in any such suit, action or proceeding, wherever the validity of such improvement district is brought in question, after the expiration of ten days from the filing of said opinion with the highway commission, said opinion of the attorney shall be admitted and received in evidence as to the validity of the district, and the only defense which can be offered against the validity of any bonds or evidence of indebtedness executed by the improvement district shall be forgery or fraud. But this article shall not be construed to give validity to any bonds or evidence of indebtedness as may be issued in excess of the limits fixed by the constitution or contrary to its provisions, but all such bonds or evidence of indebtedness shall to the extent of such excess levy be void; provided, further, that the attorney so selected by the highway commission shall give advice at any time when called on to the Department of State Lands, Highways and Improvements; which advice of said attorney, when acted upon by said department, shall exonerate said department for legal mistakes made in pursuance to said advice.

Section 13. The Legislature of the State of Arkansas hereby assents to the provisions of the Acts of Congress approved July 11, 1916, 39 State L. 355, entitled "An act to orovide that the United States shall aid the states in the construction of rural post roads and for other purposes." The State Highway Department is hereby authorized to enter into all contracts and agreements with the United States Government relating to the construction and maintenance of rural post roads under the provisions of the said act of Congress, to submit such schemes or program of construction and maintenance as may be required by the secretary of agriculture, and do all other things necessary fully to carry out the cooperation contemplated and provided for by the said act. The good faith of the state is hereby pledged to make available funds sufficient to equal the sums apportioned to this state by the United States Government during each of the five years for which federal funds are appropriated by the said act; and to maintain the roads constructed under the provisions of said act, and to make adequate provisions for carrying out such maintenance. All moneys accruing to the state highway fund created by this act and available for expenditure in the construction and maintenance of highways, and all federal funds apportioned to this state under the said act of Congress shall be expended upon the highways comprising the system of state roads provided for by this act.

Section 14. That the State Highway Department is hereby authorized to make all such rules and regulations as may be necessary to carry out the provisions of this act.

Wherever the phrases, "State Highway Department," "Department of State Lands, Highways and Improvements," Highway Commission," "Highway Department," or "State Highway Commission" occur in this act they shall be construed to mean "State Highway Commission."

Section 14. There is hereby appropriated the sum of $496,184.60 out of the highway improvement fund for the purpose of carrying out the provisions of this act.

Section 15. All laws and parts of laws inconsistent with the provisions of this act are hereby repealed.

Section 16. This act being necessary for the immediate preservation of the public peace, health and safety, an emergency is hereby declared to exist, and this act shall take effect and be in full force from and after its passage.

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The Good Roads Movement in Kentucky[*]

By RODMAN WILEY[†]

Although Kentucky has been known as the dark and bloody ground, a study of her history will show that she is not as uncivil as frequently pictured. As early as 1810, Kentucky had a highway commission, the chief engineer of which drew a salary of $5,000 per annum, and he was surrounded by a corps of engineers whose salaries ranged from $1,600 to $2,500 per year.

The Legislature of the state appropriated the funds and there were laid out and built several hundred miles of trunk line highways. The roads built under the direction of those engineers were most excellently located and properly drained and stand today as monuments to the engineering profession.

Along about 1838, the state Legislature abandoned the extension of state aid for the building of roads and the highway department was abolished, all of which was done perhaps because of the fact that the building of railroads was bulking large at that time and the masses of the people seemed to think that with a system of railroads a highway system was unnecessary.

From 1838 until 1912 the highways of Kentucky were in the hands of toll gate companies which operated roads for profit alone, and those that were not controlled by corporations were under the direct supervision of county authorities.

It is noteworthy that during that period the larger percentage of roads were improperly located and poorly drained and today the maintenance costs are enormous, but churches, schools and residences have been built along the old roads and it is now practically impossible to change the location owing to the extensive improvements which have been made.

The 1912 session of the Legislature established a highway department but clothed it only with advisory authority and it was not until 1914 that the highway department was furnished with any funds to aid in the construction of roads. At that time the Legislature placed a tax of 5 ct. on the hundred dollars' worth of taxable property in the state and that, together with the automobile licenses, constitutes the state road fund.

The inter-county-seat system was adopted as the system of roads first to receive state aid and after such roads have been improved state aid is to be extended to all the roads in any county. The law is so framed that the county and state share equally in the cost of the improvement. All roads and bridges receiving state aid are built under the direction of the highway department and to date there have been prepared standards for both concrete and steel highway structures and specifications to cover practically every type of road.

In the past three years, under the state aid plan, about 1,900 mi. of roads have been improved at an approximate cost of $5,000,000. The larger percentage of the road improvement consists of the resurfacing of old established macadam roads.

Kentucky is now operating under a constitution which is most antiquated. The counties of the state are prevented from raising the necessary funds for road construction and maintenance because of the constitutional limitations, and it has been found that most of the counties have not sufficient funds to carry on progressive road programs. Being prevented from levying a sufficient tax the only alternative is a bond issue. In fact, practically one-fourth of the counties of the commonwealth have voted bonds and voted arbitrary amounts without giving due consideration to the fact that the bond issue was in most cases insufficient in amount to make the expected improvement.

Financiers and legislators have closely watched the situation and have decided most emphatically that such a procedure is very unwise, and at the extraordinary session of the Legislature in 1917, a remedy was made possible by a law which allows the fiscal court to call an election to vote on an additional tax of any amount up to 20 ct. on the hundred dollars worth of taxable property and to run for a period of not longer than 10 years, the proceeds of such levy to be used exclusively for the improvement of roads and bridges within the county. It requires a majority vote to carry the measure.

In support of the above direct taxation for road purposes it is known to all that road enthusiasts in the various counties of any state frequently make promises which cannot be fulfilled after the voting of a bond issue. In fact, most bond issues for county road work are voted in arbitrary amounts and the speakers in order to carry the issue will promise roads in every section of the county. But after

(Continued on page 210)

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[*] Address at the 9th annual convention of the Southern Commercial Congress, New York, N. Y., Oct. 15-17, 1917.

[†] Commissioner of Public Roads of Kentucky.

GOOD ROADS

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Number 16

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

OCTOBER 20, 1917

LIBERTY BONDS

There are so many reasons for buying Liberty Bonds that almost any individual can find one that applies particularly to his own case.

There are so many plans for paying for the bonds that almost any individual can choose one that will put comparatively little strain on his pocketbook.

The second issue of Liberty Bonds offers an opportunity to save and serve, to lay aside a fund for a rainy day and do your bit to avert a rainy day for the nation.

At the present time there isn't a going concern in the world as prosperous and as sure of future prosperity as the United States of America. A Liberty Bond is a promise to pay the amount of the bond with interest at 4%, back of which are all the vast resources of that concern—in other words, it is a first mortgage on the nation.

If it so elects, the Government may pay the bonds at any time after Nov. 15, 1927, ten years hence; it must pay or refund by Nov. 15, 1942, twenty-five years from now. The bonds are sold in denominations of $50, $100, $500, $1,000, $5,000, $10,000, $50,000, and $100,000. A purchaser is permitted to buy bonds to any amount and in any denominations he chooses. He may pay for them on the installment plan or, except in the case of purchases of more than $1,000 worth, may pay cash with his application.

Either registered or coupon bonds may be had in all denominations except $50,000 and $100,000 which are issued only as registered bonds.

The coupon bond is more readily sold than the registered bond, for the transaction involves nothing but the exchange of the bond for its purchase price. Those issued first will carry only four coupons, but will be exchanged, between Nov. 15, 1919, and May 5, 1920, for other bonds carrying the remaining coupons. It has been necessary to resort to this expedient because the amount of work that the Bureau of Printing and Engraving has been called upon to turn out has made it impossible to prepare bonds with the full number of coupons at this time. To collect interest on the coupon bonds it is necessary only to clip the coupons when they become due and present them at any bank, or to the postmaster at any post office.

The registered bonds are safer than the coupon bonds, because records of their ownership are kept by the Treasury Department, and if lost or stolen they can be recovered more easily. Checks are mailed to the owners of registered bonds as interest falls due. Bonds of this kind are less easily transferred, since the proper records have to be made.

Interest on both kinds of bonds is payable semi-annually, on May 15 and Nov. 15. If bonds bearing interest in excess of 4% are issued later, the 4% bonds may be exchanged for them.

The principal and interest are exempt from all taxes except estate or inheritance taxes and the surtaxes provided for by the federal income tax law. This means that so far as the man with an annual income of less than $5,000 is concerned, the bonds are tax free.

Both the interest rate and the tax exemption provisions have been fixed for the purpose of attracting people of small means, who are not frequent buyers of securities, rather than large investors.

The amount of the issue is fixed at $3,000,000,000 plus one-half of any amount subscribed in excess of that sum. All purchasers of bonds in amounts not exceeding $1,000 will be allotted the full amounts. Subscriptions of more than $1,000 will be scaled down as necessary to keep the issue within the maximum limit set.

The terms on which the Government sells the bonds are as follows: 2% with application; 18% Nov. 15, 1917; 40% Dec. 15, 1917, and 40% Jan. 15, 1918, with accrued interest on the two deferred payments. These, however, are merely the Government's terms. Banks and other agencies accept subscriptions and allow much easier terms, thus offering further inducements to people of small means, and, therefore, small saving power.

To only a few of the hundred millions of people in this great country is it given to serve on the battle line. All can serve by lending their money to the nation for the purchase of arms, ammunition, food and clothing for those who fight; for the building of merchant ships and aeroplanes, and for the hundreds of items incident to the conduct of the war. The offering of Liberty Bonds is a call to duty and an unusual investment opportunity, especially to those of modest income, for no amount is too small to count in winning the war and every dollar put into the bonds is well and safely invested.

Besides the actual addition to the money resources of the nation from the sale of the bonds, there is a no less real benefit from the habit of saving that will result from the purchase of bonds. Americans are notoriously lacking in thrift, as a nation, and it is not unlikely that one of the greatest benefits accruing to this country from its successful prosecution of the war will be an increase in the saving power of the people. And in this connection it should be remembered that payments for Liberty Bonds should be made from current savings. The withdrawal of money from savings bank accounts to buy bonds may bring a slightly greater interest but it will not add to the financial resources of the nation. In like manner, the selling of other securities and the reinvestment of the proceeds in Liberty Bonds will not react to the general good.

To help bring certain victory to the United States and the Allies and so insure your own future, to cultivate the habit of saving, and to make your savings work for you, your country and the human race, buy a Liberty Bond and pay for it out of your savings.

And as all applications must be in by Oct. 27, do it now. While the early sales in many localities were below the amounts set, there is no doubt but that the American people will respond to the call and insure the floating of the $3,000,000,000 of bonds. Indeed, there is little doubt but that the issue will be oversubscribed. An oversubscription is desirable not only because the money will be needed, but because it will show to the world that the United States is in earnest, that it is in the war to win.

The Good Roads Movement in Kentucky

(*Continued from page* 208)

surveys and estimates are made it is found that the promises cannot be fulfilled and consternation reigns supreme.

The State Highway Department of Kentucky does not favor a bond issue in any county unless the roads to be improved are first designated by the court, accurate surveys and estimates of cost made of the proposed improvements and a bond issue then voted which will be sufficient to do whatever is desired. The people will then know what roads are to be improved, and the cost. A great many will say that it will be practically impossible to carry a bond issue under the above conditions. Personally, I am frank to say that I would rather see the issue defeated than to make false representations to the people, and I believe furthermore that when the public has once been deceived concerning road improvments the road movement in that county is killed for a number of years. I am also of the opinion that the type of improvement under a bond issue should last as long as the bonds, which would mean that the funds must be invested principally in grading and installing proper drainage structures and building the most permanent types of pavement known, unless it can be shown by competent engineers that a less permanent type of improvement combined with maintenance charges is more economical than one of the more permanent types.

Under the direct tax which it is possible for any county to vote in Kentucky it is believed that sufficient revenue can be obtained to build a good system of roads in most counties without bonds or debt and I also believe it will produce as much revenue as can be intelligently expended from year to year.

Kentucky has no law that will allow the state to extend aid in the maintenance of roads, but it is most probable that the next session of the Legislature will pass a maintenance law.

Under the federal aid plan it is proposed to build only trunk line roads in the State of Kentucky, such as east and west and north and south main thoroughfares. It is the intention of the highway department to cooperate with the adjacent states and if possible to meet them at the border with their federal aid schemes.

In conclusion, I will say that the people of Kentucky are alive to the importance of more and better roads and that they have been thoroughly satisfied that the building of roads is an engineering problem. I predict that at no far distant date there will be a competent highway engineer employed by every county, whose duty it will be to see that the roads are built and maintained according to the latest accepted standards. And when such time shall come Kentucky with all her traditions, fertile fields and untold natural resources will not bow her head to any state in the Union.

ROADS OF MARYLAND*

By **HENRY G. SHIRLEY**†

The topographical and climatic conditions of Maryland vary greatly. In the western portion of the state are found the high ranges of the Alleghanies, with their rugged and broken contours and with temperature ranging from 100 degrees in summer to 20 below zero in winter. The central portion is of a rolling contour with many hills and vales, with streams winding among them on their way to the Chesapeake Bay. The climate is moderate, but changeable, there being much freezing and thawing, making it very severe on road foundations. The southern portion lies between the Potomac River and the Chesapeake Bay and the greater portion is rolling in nature, and the climate reasonably mild. The eastern portion, known as the Eastern Shore, lies between the Chesapeake Bay on the west and Delaware and the ocean on the east. The country is level, the soil generally very sandy, and the climate mild. Road materials of abundant supply and good quality are found in the central portion, poor gravel in the southern end, soft sandstone through the Alleghanies in the western section and no material on the Eastern Shore, with the exception of sand and a few oyster shells.

The roads outside of the incorporated towns are classified as state roads, state aid roads and county roads. State roads are built from the proceeds of state bond issues, and maintained out of the automobile license fund, under the supervision and control of the State Roads Commission. The state aid roads are petitioned for by the county commissioners, the survey, plans and specifications are prepared by the State Roads Commission, and the work done under the supervision of the state. The state pays 50%, the county 40%, and the abutting property owners 10% of the construction cost. On completion, the work is taken over and maintained by the State Roads Commission out of the automobile license fund. The county roads are constructed and maintained by the county officials. There are between 16,000 and 17,000 mi. of roads in the state, of which something less than 10% have been selected to form a main state trunk line system. It is estimated that this trunk line system carries from 75 to 80% of the entire traffic of the state. The roads were so selected that all county seats and large towns in the state would be connected with each other and Baltimore City. This system has been practically completed, there being an improved road from where the Old National Road enters Maryland from Pennsylvania on the west through the entire state to Ocean City on the southeastern water front and to the Eastern Shore, Virginia on the south, and a line to Washington and Southern Maryland to Point Lookout on the south, and a number of other lines connecting important centers and neighboring states. Connections have been made with Pennsylvania, West Virginia, Virginia and Delaware, giving easy and convenient connections with the highway systems of these states.

There has been expended about $24,000,000 on this system, including building an east-west and north-south route through Baltimore City, where it was necessary to build a bridge costing $1,250,000 across the middle branch of the harbor making a total expenditure in the city of Baltimore of between $5,000,000 and $6,000,000. There were also many long and costly bridges erected throughout the state on this system.

The work is under the control of a commission, known as the State Roads Commission, consisting of three members appointed by the governor and holding office at his pleasure. The chairman devotes his entire time to the work, and the other two members are subject to his call. All proceeds from bond issues and automobile license fees are turned over to the commission to be expended by it as it deems most expedient. The chief engineer is appointed by the commission and is the executive officer. All surveys, plans, specifications, bridge work, construction and maintenance are carried on under his supervision. The state is divided into seven residencies, and in each residency is placed a resident engineer, who has charge of all construction and maintenance work in that residency and reports directly to the chief engineer. All surveys, tests and plans are under the engineer of surveys, who is the first assistant engineer.

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*Address at the 9th annual convention of the Southern Commercial Congress, Oct. 15-17, 1917.

†Chief Engineer, Maryland State Roads Commission.

All employees are classified into classes and are advanced to a higher class for efficiency and good work, after serving one year. The patrolmen are appointed by the resident engineers and are under their control. All construction work is let by contract and much of the oiling work is let on the same basis. Thicker and stronger types of surfacing are now being used than when the work was first started, and the width has been increased to take care of the increased volume of traffic. Many of the roads first constructed were only 14 ft. wide, but the commission has found this an inadequate width, and is now widening them out. Traffic is taken at permanent traffic observation points monthly, and classified. At each traffic point there are established true elevation points from which measurements are taken at stated periods to ascertain the amount of wear due to a certain amount of traffic. Readings are taken just before oiling and just after oiling or repairs to give the true amount of thickness added to the surface and likewise the amount worn off by traffic. These observations have shown that temperature changes very materially affect the surface crust, and there is an internal wear of a very serious and rapid nature in all non-monolithic construction. It has been the object of the commission to put back each year just a little more than the aggregate of all wear, and they believe that under this method the roads will get thicker and stronger each year rather than thinner and weaker.

All maintenance cost has been computed on a ton-mile basis, for a road carrying 2,000 tons per day is of more service to the state than one carrying 200 tons. We have found the most expensive maintenance on the light traveled roads through the Alleghanies where it runs as high as 0.8 ct. per ton-mile, whereas on some of the old macadam roads leading up to Baltimore City, carrying 2,500 tons per mile per day, the cost has been only 0.2 ct. per ton per mile. The average over the entire state is 0.4 ct. per ton per mile. The main arterial system has about been completed, but there are many miles of secondary lines yet to be constructed and the commission will devote its energies to constructing these secondary lines, to the continuation of the state aid roads, and to the rebuilding of a number of large old wooden bridges which have become weak and unsafe for heavy loads.

Illinois Bond Proposal Indorsed by Farm Papers

At a recent gathering in Chicago, the editors of a number of Illinois farm papers indorsed the following resolutions relative to the proposed law providing for a $60,000,000 state bond issue for highway improvement:

1.—We believe in hard roads.

2.—The system of hard roads provided for by this bond issue will be a substantial step in pulling Illinois out of the mud. It will connect all principal county seat towns in the state and will be the entering wedge of a system of all-year-round roads that will provide country people with the social, educational and economic advantages that good roads bring.

3.—The road system will add materially to farm land values in Illinois.

4.—We want suitable hard roads as soon as we can get them. Even if this bond issue is approved by the voters at the general election in 1918, it will be 1920 before the actual construction can be started, and if it is defeated it will be 1922, or more likely 1924, before Illinois can make a substantial beginning in hard road construction. We do not believe the people of Illinois want to wait that long before taking a definite step toward better roads.

5.—In case the bond issue is approved, it will be possible to start road construction on a big scale at the conclusion of the war, when labor and material will be plentiful and reasonable in price.

6.—We do not believe in piecemeal road construction, but in a definitely planned permanent system that looks to the future and will take care of a great part of our road building for years to come. If the money accruing from automobile license fees is not used for such a bond issue system, it must be used hit and miss as in the past.

7.—We want Illinois farmers to enjoy all the advantages farming affords anywhere, and we feel that a state-wide system of hard roads is essential to this end.

Coast Highway in California Nearing Completion

Only about 50 mi. of the Coast Highway in California remain to be paved, according to a recent report from the state. This highway extends from San Francisco to San Diego, a distance of 494 mi., of which 379 mi. have been paved, and 44 mi. are under construction by the State Highway Commission. It is stated that the remaining links will be closed as soon as labor and material conditions will permit. The mileage of paved roads does not include about 93 mi. within municipalities over which the commission has no authority.

Sign Posting the Mojave Desert

The United States Government has commenced the actual work of placing signs on the Mojave Desert in California to indicate the presence of water holes.

O. E. Meinzer, who has charge of the ground waterways division of the U. S. Geological Survey, is directing the work for which an appropriation of $10,000 has been made available by the government to make the desert trail safer for travelers. It is expected that the erection of these steel signs will largely stimulate transcontinental travel over the desert route.

Military Motor Truck Test Postponed

Due to a continuous rainfall which damaged the southern portion of the Dixie Highway between Chattanooga, Tenn., and Atlanta, Ga., and which almost isolated Camp Gordon near Atlanta, it was found necessary by the joint committees of the Georgia State Automobile Association, the Dixie Highway Association and the Chattanooga Automobile Club to postpone for thirty days the military motor truck test between the Quartermaster's Depot in Atlanta and the Supply Depot at Ft. Oglethorpe, which was to have taken place Oct. 11.

In the test it is proposed to use six 2-ton trucks carrying government supplies under military escort. A comparison of data obtained with the time required to make the trip, will be made with similar data as to the time and cost of making a similar shipment by freight.

Bids for Highway and Bridge Construction in Pennsylvania

Bids were opened recently by State Highway Commissioner O'Neil for the construction of roads in several counties of Pennsylvania and for bridges throughout the commonwealth.

The highways to be improved are in Cambria, Lackawanna, Washington, Allegheny, Lehigh, Butler, Westmoreland, Montgomery and Venango Counties.

In Cambria County, Jackson and East Taylor Townships, the project—improvement of State Highway Route 52—was divided into two sections for the convenience of bidders. On Section 4-C, East Taylor Township, 9,878 ft. of vitrified block, 16 ft. wide, the bidders were as follows: E. H. Brua, Hollidaysbury, $78,855.43; Manwaring & Cummins, Inc., Philadelphia, $92,934.30; G. T. Morgan, Johnstown, $83,900.75; John L. Elder, Ebensburg, $79,624.46; Richard Hopkins, Troy,

N. Y., $80,751.60. On Sec. 4-B, Jackson and East Taylor Townships, 11,070 ft., vitrified block, 16 ft. wide, the bidders were: Manwaring & Cummins, Inc., $109,889.60; John L. Elder, $95,881.60; E. H. Brua, $96,520.19.

Lackawanna County, Moosic and Old Forge Boroughs, State Aid Applications Nos. 442-487, 6,562 ft., reinforced concrete, 16 ft. wide; bidders, O'Brien Brothers, Avoca, Pa., $32,308.73; H. B. Sproul Construction Co., Inc., Peekskill, N. Y., $35,138.80; Hagen Lumber Co., Scranton, Pa., $44,132.40; P. J. Boyle Construction Co., Wilkes-Barre, Pa., $32,995.17; Gibbons & Buckley, Philadelphia, $25,498.96; Matthias Stipp & Son,. Scranton, $27,641.65; Herrick Construction Co., Wilkes-Barre, $33,792.00; John J. Phillips, LaPlume, Pa., $58,558.50.

Washington County, Cecil and North Strabane Townships, State Highway Route 108, 19,318 ft., vitrified block and reinforced concrete, 16 ft. wide; bidder, Peter F. Connolly, Elmira, N. Y., $165,139.80. East Bethlehem Township, State Highway Route 268, 5,900 ft. vitrified block and reinforced concrete, 16 ft. wide; bidder, Crossan Construction Co., Brownsville, Pa., $75,322.00.

Allegheny County, South Fayette Township, State Highway Route 108, 16,852 ft., vitrified block and reinforced concrete, 16 ft. wide; bidder, Robert Swan, Jr., Pittsburgh, $210,720.96.

Lehigh County, Hanover Township, State Highway Route 159, 11,857 feet, reinforced concrete, 16 to 20½ ft. wide; bidders: J. C. Bentley, Elizabeth, N. J., $72,857.80; George H. Hardner, Allentown, Pa., $69,374.80; Richard Hopkins, Troy, N. Y., $76,838.00; Manwaring & Cummins, Inc., Philadelphia, $78,216.35.

Butler County, Clinton Township, State Aid Application No. 417, 5,800 ft. vitrified block pavement, 16 ft. wide; bidders: Robert Swan, Jr., $64,105.50; Norman J. Boyer, Butler, Pa., $30,255.97; Kennedy Contracting Co., Utica, N. Y., $34,729.96.

Westmoreland County, East Huntingdon Township, 2,540 ft., vitrified block, 16 ft. wide; bidder, Rimonti Galiardi, Connellsville, Pa., $20,955.80.

Montgomery County, Upper Moreland, Abington and Upper Dublin Townships 6,537 ft., reinforced concrete, 16 ft. wide; bidders: Manwaring & Cummins, Inc., $50,651.65; Ambler, Davis Co., Philadelphia, $44,349.60; Juniata Co., Philadelphia, $45,511.05.

Venango County, Cornplanter Township, State Aid Application, No. 681, 7,857 ft., vitrified block, 16 ft. wide; bidder, Elmer M. Love & Son, Corry, Pa., $56,663.45.

The location of the bridges for which bids were received, the names of bidders and amounts of bids were as follows:

Lancaster County, Bart Township, 24-ft. span, York Bridge & Construction Co., York, Pa., $3,915.80.

Montour County, Liberty Township, 16-ft. span, Walter A. Godcharles, Milton, Pa., $1,606.33.

Columbia County, Franklin Township, 8-ft. span, Hampton Construction Co., Wilkes-Barre, $3,899.10; Cleveland Township, 6-ft. span, Hampton Construction Co., $2,119.60.

York County, Carroll Township, double 20-ft. span; York Bridge & Construction Co., $3,463.20, and Walter H. Drawbaugh, Dover, Pa., $3,667.00.

Susquehanna County, Brooklyn Township, 16 ft. span; Seaman, Irwin & Brenneman, Honesdale, Pa., $2,486.60, and John J. Phillips, LaPlume, Pa., $2,180.60. Lenox Township, 16-ft. span, John J. Phillips, $2,036.55, and Seaman, Irwin & Brenneman, $1,862.60. Forest Lake Township, 18-ft. span, John J. Phillips, $2,018.25, and Seaman, Irwin & Brenneman, $1,898.20.

Monroe County, Pocono Township, 16-ft. span, Seaman, Irwin & Brenneman, $1,821.60, and Harry F. Mackes, East Stroudsburg, $1,347.45. Stroud Township, 12-ft. span, Harry F. Mackes, $1,004.45, and Seaman, Irwin & Brenneman, $1,358.60. Tobyhanna Township, 14-ft. span, Harry F. Mackes, $1,110.45, and Seaman, Irwin & Brenneman, $1,388.60; 10-ft. span, Harry F. Mackes, $1,109.88, Seaman, Irwin & Brenneman, $1,415.84.

Wayne County, Dreher Township, 10-ft. span, Seaman, Irwin & Brenneman, $1,500.84.

No bids were received for the bridges which had been advertised in Berks, Indiana, Lancaster, Sullivan and Northampton Counties.

County Engineers Needed in Kansas

The State Highway Commission of Kansas has from time to time approved the appointment of engineers for various counties of the state, but there are yet a few counties that have not appointed their engineers. Military draft and enlistments, however, have reduced the number already appointed with the result, according to report, that a shortage of county engineers exists throughout the state.

Proposed Street Paving in Baltimore, Maryland

An extensive paving program affecting from 25 to 30 mi. of main and other streets in Baltimore, Md., is being planned by the Paving Commission of that city, for 1918, for which a paving fund of $1,000,000 is asked. The thoroughfares selected for improvement include the following:

Greenmont Ave., from Hillen St. to North Ave.; Fayette St., from Poppleton to Smallwood; Lombard, from Fremont to Payson; Federal, from Broadway to eastern city line; Preston, from Gay to eastern city line; Milton Ave., from McElderry to North Ave.; Luzerne, from Eager to Federal; Bond, from Baltimore to Madison; Federal, from Broadway to Gay; Smallwood, from Lexington to Franklin; Forrest, from Monument to Eager; Bethel, from Pratt to Madison; Albemarle, from Baltimore to Pratt; Linwood, from Madison to Federal; Lancaster, from President to Caroline; Aliceanna, from East Falls to Caroline; Luzerne, from Baltimore to Madison; Collington, from Biddle to Ashland and from Pratt to Fleet; Chester, from Pratt to Fleet; Biddle, from Montford to Loney's Lane; Ellwood Ave., from O'Donnell to Eastern Ave.; Russell, from Stockholm to Bush; Mulliken, from Ann to Aisquith; Ashland Ave., from Aisquith to McKim; Stirling, from Mott to Aisquith; Spring, from Biddle to Hoffman; Clinton, from George to Myrtle Ave.; Edmonson Ave., from Clinton to Fremont; North Ave., from Port to Mine Bank Lane; Winder, from Light to Hanover; William, from Clement to Fort Avenue; Clement, from Light to William; Raborg, from Stockton to Greene; McElderry, from Milton to Linwood; Madison, from Patterson Park Ave. to Luzerne; Lombard, from Hanover to South; Pratt, from Broadway to Patterson Park Ave.; Arlington Ave., from Baltimore to Pratt; Gough, from Central Ave. to Lloyd; Stiles, from Central Ave. to East Falls Ave.; Exeter, from Pratt to Fleet; Center, from the Fallsway to Courtland; William, from Clement to Fort Ave.; Charles, from Read to Chase; Lexington, from Guilford Ave. to Calvert; Franklin, from Charles to Howard; Caroline, from Pratt to Monument; and Lanvale, from Fulton to Carrollton.

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In the Province of Foochow, China, about 8 mi. of macadam roads with drains and culverts were completed in 1916. A United States consular report states that in less than a year 838 rickshas, 90 bicycles, and 48 modern vehicles with rubber tires were in use on the road, whereas before it was constructed not a single ricksha, bicycle or carriage was in use in the district.

The Permanent Highway System of Nebraska, composing several thousand miles, has been mapped by State Engineer George E. Johnson. Nineteen project districts have been designated each district covering from four to five counties. The system will be improved with federal, state and county funds. A combined federal and state fund of more than $3,000,000 will be apportioned to the counties according to law on the basis of area, population, and mileage of rural and star routes.

MEETINGS

Calendar of Coming Meetings

Oct. 29-30.—Oklahoma Society of Engineers.—Annual convention, Oklahoma City, Okla. Secretary-Treasurer, H. V. Hinckley, Oklahoma City, Okla.

Nov. 19-20.—National Paving Brick Manufacturers Association.—Annual meeting, Cleveland, Ohio. Secretary, Will P. Blair, 830 Engineers Building, Cleveland, Ohio.

Nov. 19-24.—City Managers' Association.—Annual meeting, Detroit, Mich. Secretary, W. L. Miller, City Manager, St. Augustine, Fla.

Nov. 21-24.—National Municipal League.—Twenty-third annual meeting, Hotel Statler, Detroit, Mich. Secretary, Clinton R. Woodruff, 703 North American Building, Philadelphia, Pa.

Dec. 4-6.—American Association of State Highway Officials.—Annual meeting, Hotel Jefferson, Richmond, Va. Acting Secretary, H. M. Berry, Chapel Hill, N. C.

Jan. 15-17, 1918.—Virginia Good Roads Association.—Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

American Road Builders' Association

The annual meeting of the American Road Builders' Association for the election of officers and the transaction of other business will be held at the Automobile Club of America, 247 W. 54th St., New York, N. Y., on Friday, Nov. 2.

The meeting of the association will be held at 3:00 p. m., and will be preceded by a directors' meeting at 2:00 p. m. The polls will close at 4:00 p. m., and after a recess, the members will reassemble for the annual "get-together dinner" in the club grill room. After the dinner the report of the tellers will be received and addresses will be made. Among those to speak are A. W. Dean, Chief Engineer of the Massachusetts Highway Commission, who is the retiring president; the new president, and invited guests.

Southern Commercial Congress

The subject of good roads occupied a prominent place on the program of the ninth annual convention of the Southern Commercial Congress held at the Hotel Astor, New York, N. Y., on Monday, Tuesday and Wednesday of this week. The forenoon session on Tuesday was devoted to addresses on this subject as was one of the four section meetings held on the afternoon of the same day.

At the Tuesday forenoon session, Dr. Clarence J. Owens, Managing Director of the congress, introduced as the presiding officer William F. McCombs, Chairman of the New York Good Roads Committee of the congress. Mr. McCombs spoke briefly welcoming the congress to the city and emphasizing the importance of road work, especially at this period of the country's history. He said that three years ago the good roads of France saved that nation, for without them the Germans would have entered Paris, England probably would have succumbed, and by this time the entire world, including the United States, might have been dominated by Germany. There are 30,000,000 children of school age in the United States, according to Mr. McCombs, and only 18,000,000 of them actually attend school, because of bad roads. In closing, he spoke at some length upon the importance of good roads as defensive measures and said that no program of national defense would be perfect unless it included a program for the building of public highways. The constitutional authority for such work by the nation exists and the people have a right to demand that the government provide the roads.

H. B. Varner, Editor of "Southern Good Roads," was introduced as the next speaker. Mr. Varner's address was a review of the history of road building in the South, in which he compared present conditions with those obtaining twenty years ago before work had been commenced by the several states. The federal aid law, according to Mr. Varner, has been a large factor in stimulating road work throughout the South.

Mr. Varner was followed by George C. Diehl, Chairman of the Good Roads Board of the American Automobile Association. One of the chief points made by Mr. Diehl was the necessity for continued activity in road work. He also expressed the opinion that the county should be the smallest unit concerned in road work, the roads being built by the nation, the state and the county. He also urged the use of federal funds for the construction of through roads instead of local roads, and said that eventually federal roads should be built and maintained at the sole expense of the federal government, state roads at the sole expense of the states, and county roads at the sole expense of the counties. State highway commissions should be clothed with adequate power to carry on highway work in the several states.

Edwin Duffey, Chairman of the New York State Commission of Highways, spoke next. So far as public work is concerned, according to Mr. Duffey, the building of highways is first in importance. He sketched briefly the history of road administration in New York and described, at some length, the present situation, paying especial attention to plans for the use of federal aid funds in the state and the general effect of this aid upon the state's road improvement plans. He also emphasized the necessity for skilled engineering organizations to carry on road work, saying that the old idea that anyone could build a road was a grave mistake although it was still held by some people, even in New York. In closing, Commissioner Duffey paid a tribute to the engineering forces in his own state.

A. G. Batchelder, Executive Chairman of the American Automobile Association, was the last speaker. Mr. Batchelder said that the nation as a whole had been negligent in the improvement of its roads. He said that at present the federal aid law was undergoing a severe test. If it works out satisfactorily, according to Mr. Batchelder, the people can go back to Congress with a request for much larger appropriations. He spoke at some length upon the advantages of good roads and said that it would pay to build them and build them right.

The afternoon session on Tuesday was devoted to discussions of the road situation in various southern states by a number of southern road officials. In the absence of Mr. McCombs, H. B. Varner presided.

The first speaker of the afternoon was Judge T. E. Patterson, Chairman of the Georgia State Highway Department. Judge Patterson said that the good roads problem in the South was a difficult one, as the people were conservative and it was difficult to interest them in new forms of activity. At present, however, they are alive to the necessity of good roads and are commencing an extensive program of road betterment. He spoke at some length upon the application of the federal aid law in his state and upon the difficulties that had been encountered in its actual operation. The constitution of Georgia does not permit the appropriation of state funds for internal improvements, so that it has been necessary to apply federal aid through the county administrations. In addition to this difficulty, considerable trouble has been experienced in securing approval of roads forming through routes.

Rodman Wiley, Commissioner of Public Roads of Kentucky, followed Judge Patterson. Mr. Wiley spoke briefly reviewing the history of road work in Kentucky and describing the present laws and methods of carrying on work. His address is printed in full on other pages.

W. S. Fallis, State Highway Engineer of North Carolina, described at some length the highway situation in that state, reviewing the history of the state highway department and stating its plans for future work. It is proposed to use the federal aid funds to build gaps in the existing state system. The maintenance of the existing roads is also one of the outstanding features of the highway department's plans. One of the recent laws of the state permits the commission to expend the money received from automobile fees for this purpose and another recent law permits the use of state convicts on roads. It is hoped that in a few years, it will also be possible to have the county convicts turned over to the state authorities so that they can be worked economically in large gangs instead of in small county gangs, as at present.

The last speaker was Chief Engineer Henry G. Shirley, of Maryland State Roads Commission. Mr. Shirley's address is printed on other pages.

National Paving Brick Manufacturers Association

Cooperation and organization for efficiency in view of conditions resulting from the war, will be the keynote of the annual meeting of the National Paving Brick Manufacturers Association at Cleveland, Ohio, Nov. 19 and 20.

The meeting will be in the nature of a general conference of the paving brick industry, to which all manufacturers of paving brick are invited. It is believed by the Office Board of the association that more good to the country and to the industry can be effected by a conference in which the entire industry is represented by its active executive officials than by any other undertaking.

The board states that: "The complex situation arising from the country's requirement for the greatest transportation facilities—with that very need hindering the receipt of materials and fuel needed in the manufacture of brick, as well as delaying paving work which should furnish transportation relief and with the Council of National Defence recommending short haul freight to be transported over the highways, which are not—presents problems seldom found in business experience."

The program of the meeting is being prepared.

Highway Traffic Association of the State of New York

At the annual meeting, held at the Automobile Club of America, New York, N. Y., on October 10, the Citizens' Street Traffic Committee of Greater New York voted to change its name to the Highway Traffic Association of the State of New York. This action was taken in accordance with the recommendations of the Executive Committee made at a meeting on Sept. 26.

It was voted to change the titles of the officers formerly designated as chairman and vice chairman to president and vice president, respectively, and to add the office of honorary president.

The names of candidates for officers for the ensuing year were presented and, on motion of the secretary, one ballot was cast for them. The election resulted as follows:

Honorary President, William P. Eno; President, Prof. A. H. Blanchard; Vice President, David Beecroft; Secretary, Elmer Thompson; Treasurer, George H. Pride.

The Executive Committee for the coming year was reelected as follows: Walter R. Addicks, A. H. Blanchard, L. Barton Case, David Beecroft, Robert G. Cooke, Richard W. Meade, Joseph K. Orr, George H. Pride, S. W. Taylor, Elmer Thompson, William P. Eno.

Fourth California Conference on City Planning

With three of the most important state commissions of California urging city planning as the basis for their work, the Fourth California Conference on City Planning and the convention of the League of California Municipalities, held at Santa Rosa, Sept. 25-27, not only showed progress but that city planning has arrived to stay.

Max Thelen, President of the State Railroad Commission, while warning the twenty-two city planning commissions of the state that changes and readjustments in transportation lines on future city plans must promote greater safety and convenience, stated that his commission had the complete power to order union depots, the joint use of tracks by two or more lines and the elimination of grade crossings, with power to assess the costs to the railroads, the city or the county. "Patriotism precludes the possibility that the commission authorize any large expenditure now," he said. "However, now is the time to prepare for such changes in carefully worked out plans for city development after the war."

Zoning or districting of all cities as a war expedient, as an impetus to better business and in the interest of a broader and healthier community life, was urged by George L. Bell, Secretary of the State Commission of Immigration and Housing. "In France," he said, "the commission for rebuilding the devastated cities is working out a careful zoning system as the sensible basis for reconstruction. That little war-torn nation is zoning every city. If France can do it in the midst of war, America can do it now."

Charles F. Stern, State Highway Commissioner, clearly pointed out the necessity for cooperation between local city planning commissions which are formulating permanent city street plans, and the State Highway Commission which is now completing the second installment of great trunk line roads through California out of the new $15,000,000 state bond issue passed last year. That the city should pay at least a part, if not half, the cost of paving main traffic streets was a suggestion offered for serious consideration.

That zoning must be applied with caution and only after making careful surveys of actual tendencies and conditions was pointed out by Albert Lee Stephens, City Attorney of Los Angeles, whose carrying of the Los Angeles Zone Ordinance several times to the United States Supreme Court, has resulted in decisions that are epoch making for city planning in America. He said: "Whether or not this law (the new State Zoning Act), if all of its provisions shall be sustained, will benefit the small town, cannot be determined without the actual application thereof. It is my opinion that it will prove practical only in cities where natural development has impressed certain uses upon certain portions of the city to the practical exclusion of other uses. The city having, in a way, found itself, may by legislation restrict the development along the lines already generally established, so that the character of improvements in one neighborhood may not intrude to the detriment, within the meaning of the police power, of the general character of improvements in another neighborhood.

"This is the principle underlying the Los Angeles zoning law, and in my opinion is the only principle upon which safe city planning can be based."

The conference elected the following officers for 1918: President, Thomas H. Reed, City Manager of San Jose; Vice Presidents, Albert Lee Stephens, City Attorney, Los Angeles; Miles O. Humphreys, President, City Planning

Commission, Fresno; Secretary-Treasurer, Charles H. Cheney, Architect and City Planner, San Francisco.

Executive Committee: Mark C. Cohn, San Francisco; George A. Damon, Pasadena; Oscar Ford, Riverside; L. A. Handley, Los Angeles; A. F. Heuer, Alameda; W. J. Locke, San Francisco; A. S. Lavinson, Oakland; J. C. Merriam, Berkeley; Chester H. Rowell, Fresno; C. F. Stern, San Francisco; Judge Matt I. Sullivan, San Francisco; G. G. Whitnall, Los Angeles; F. C. Wheeler, Los Angeles.

Montana Automobile and Good Roads Association

The Montana Automobile and Good Roads Association which met at Helena, Mont., in September, selected Miles City, Mont., as the next meeting place of the association. Oscar Rohn of Butte was reelected President. The other officers are L. Newman, First Vice President, Great Falls: Henry Good, Second Vice President, Kalispell; R. S. Phillips, Secretary, Butte.

At the office of State Highway Engineer W. S. Keller, at Montgomery, Ala., on Sept. 25, the Montgomery County Local Branch of the Dixie Overland Highway Association was organized. Dr. Geo. Wheeler was elected President, and L D. Fairchild, Secretary-Treasurer.

PUBLICATIONS

UNITED KINGDOM. SEVENTH ANNUAL REPORT OF THE ROAD BOARD, for the year ending March 31, 1917. Issued at London, England, July 30, 1917. Paper, 8¼x13 in., 42 pp. and covers. Price 6d.

This report contains the proceedings of the British Road Board for the year ending March 31, 1917, relating to applications for advances, receipts and payments, grants and loans, and annual expenditures on roads and bridges in England and Wales, Scotland, and Ireland. The report proper is followed by appendices giving detailed statements concerning the several divisions of the report for the year, with other matter relating to the work of the board since its constitution in May, 1910.

FINANCIAL STATISTICS OF STATES, 1916. Issued by the U. S. Department of Commerce, Bureau of the Census, March 31, 1917. Report of the Bureau of the Census for the fiscal year 1916. Paper, 9x11½ in., 127 pp. and covers.

State organization and accounting, and accounting terminology are considered in the introduction to this financial report which was prepared by the Bureau of the Census. Preceding the 28 general tables which constitute the main part of the volume, are descriptions of each table. The tabular matter presents the financial transactions of the 48 states in a manner to show the net revenue collected, the net cost of conducting state business, and the indebtedness incurred thereby.

STATE HIGHWAY MILEAGE AND EXPENDITURES FOR THE CALENDAR YEAR 1916. U. S. Department of Agriculture, Circular No. 74. Prepared by the Division of Economics, Office of Public Roads and Rural Engineering, U. S. Department of Agriculture. Issued Sept. 24, 1917. Paper, 5¾x9⅛, 8 pp.

In addition to an introductory statement concerning cash and other expenditures on rural roads and bridges in the United States durinrg 1916, the matter contained in this pamphlet is presented in three tables, the first showing expenditures during 1916 by or under the supervision of the state highway departments, the second giving the road mileage built in 1916 and total mileage of public roads, and the third the cash road and bridge expenditures for the calendar years 1904, 1914, and 1916. The percentages of the total cost devoted to construction, maintenance, miscellaneous, administration, and engineering in a number of states are shown by a chart.

PERSONAL NOTES

R. E. Ulrich has resigned as Assistant City Engineer of Elkhart, Ind.

F. M. Edwards has been appointed City Engineer of Jacksonville, Fla.

Charles Colquhoun Ballantyne has become Minister of Public Works of the Dominion of Canada.

L. V. Rorke has been appointed Director of Surveys, Province of Ontario, Canada. He succeeds the late Geo. B. Kirkpatrick.

L. R. P. Reese, Assistant City Engineer of Fort Collins, Colo., has resigned and is now training at the Presidio, San Francisco, Cal.

M. O. Eldridge, Assistant in Road Economics, Office of Public Roads and Rural Engineer, U. S. Department of Agriculture, has recently completed an inspection tour of the southern states.

M. O. Bennett, Division Engineer of the Oregon State Highway Commission, at Pendleton, has resigned. The work of the eastern Oregon highway district, over which he had charge, will be assumed by another engineering division.

A. L. Luedke, formerly Assistant Division Engineer of the Wisconsin Highway Department, who resigned from that department about one year ago to become Engineer-Accountant in the U. S. Office of Public Roads and Rural Engineering, has been promoted to the position of Assistant to the Director of the Office of Public Roads.

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The 4-Mi. Road Between Georgetown and Camp Dix, Wrightstown, N. J., will be improved by the state, according to report, as a result of the refusal of the U. S. Government to improve the road.

An Asphaltic-Concrete Highway Between Helena and West Helena, Phillips County, Arkansas, is to be built at an estimated cost of $140,000, according to report. Plans for the road have been prepared by the State Highway Department.

Damages Amounting to $16,400 Against the City of Philadelphia, Pa., were recently awarded to Henry George, who was injured as a result of municipal negligence in repairing a bad street, of which the city had received notice.

The State of Wisconsin has issued 160,000 licenses for motor-driven vehicles, exclusive of motorcycles, this year, as against 115,600 issued in 1916. The former are expected to reach 165,000, motorcycle licenses, 7,000, and dealers' licenses, 2,080, during 1917.

Five Miles of Sample Graveled Road in Blackhawk County, Iowa, have practically been completed, according to plans and specifications approved by the Iowa State Highway Commission. The sample sections are located near LaPorte City, Cedar Falls, Hudson, Dewar and Dunkerton.

The Rotary Club of Superior, Wis., recently passed and forwarded to the Wisconsin State Highway Commission and the Joint Legislative Committee a resolution urging that the highway from Superior to St. Paul and Minneapolis, Minn., be adopted as a part of the trunk line system of the state.

The Snively Boulevard in Jeannette Pollay Park, Duluth, Minn., has been completed and was opened to traffic on Sept. 30. This is a gravel road 7 mi. in length. It was started about 11 years ago, and was built chiefly through the aid of philanthropic citizens, although the city also contributed towards its completion.

The Road Commissioners of Berrien County, Michigan, have recommended the expenditure of $75,000 on improving connecting stretches of highway within villages throughout the county. The following are proposed for improvement: Lake Shore Road in New Buffalo, Niles-New Buffalo Road, Galien-Stevensville Road in Baroda, Paw Paw River Road No. 1, in Coloma and in Watervliet, and the Watervliet-South Haven Road in Watervliet.

EQUIPMENT — TRADE — MATERIALS

Souvenir of the Annual Meeting of the Ransome Concrete Machinery Company

A souvenir of the dinner at the annual meeting of the Ransome Concrete Machinery Co. at its plant at Dunellen, N. J., and at the Queen City Hotel, Plainfield, N. J., on Oct. 12, 13 and 14, has been received.

The souvenir is a handsomely executed booklet consisting of 24 pages and covers, printed in red and black and tied with white ribbon. The cover is embossed and carries the company's trade mark on which the word "Ransome" is embossed in gold.

The booklet's contents include a sepia portrait of the late Ernest L. Ransome, the founder of the company, and a tribute to him; a list of officers of the company, the menu of the dinner, and a collection of songs.

Road Machinery Operators Wanted for Service Overseas

The attention of experienced operators of Austin motor rollers, gyratory crushers, elevating graders and other road machinery is called to the opportunity to serve in France by an advertisement of the Austin Manufacturing Company, of Chicago, Ill., printed in the advertising section of this issue.

Shipments of the company's machinery are being made and are to be followed by others. Men engaged in road building in France will receive from $40 to $96 a month and expenses. As noted in previous issues, an unusual opportunity to serve in the capacity in which they are best qualified is afforded to road builders of all kinds by the formation of the unit for which this call has been issued.

The advertisement referred to carries a coupon to be filled out and sent to the commanding officer of the 23d Engineers, National Army.

"Concrete Facts About Concrete Roads in Washington"

The above is the title of a 36-page illustrated pamphlet containing complete data on concrete pavements in the State of Washington.

The matter is presented chiefly in tabular form and shows among other things, the amount of Portland cement concrete pavement laid annually in the state from 1909 to 1917, inclusive, the number of miles and kinds of hard surfaced roads in the state, mileage of cement concrete and other pavement on county roads under contract Jan. 1 to Sept. 1, 1917, hard-surfaced roads built and building Sept. 1, 1917, in various countries, with half-tone illustrations of views on some of the heavily traveled highways. Specifications for one-course concrete pavements are given.

The booklet is published by the Portland Cement Manufacturers.

"Better Roads for Wisconsin"

The first issue of a magazine of the above name has recently come out. It is 6x9 in. in size, consists of 12 pages, including covers, and is published by the Wisconsin Crushed Stone Association of Milwaukee, Wis.

The first issue contains an article on "State Roads," another entitled, "Crushed Stone Concrete Replaces Gravel Concrete on Milwaukee County Roads," an article on "Convict Labor on Milwaukee County Roads" by Assistant Highway Commissioner A. B. Cope, and a number of short articles on the construction of roads with crushed stone.

The magazine is illustrated by halftones showing roads of various types. It is printed in brown ink on white paper of especially good quality, and the covers and two middle pages are printed in two colors, brown and green. The back cover carries a list of the commercial stone quarries in Wisconsin.

The magazine is to be extensively circulated in Wisconsin and will be sent free to anyone interested in the matter it covers.

The Sioux Falls Metal Culvert Co. was recently incorporated at Sioux Falls, S. D., for $100,000. T. H. Sexton is the head of the new company.

The Headley Good Roads Co. is constructing a $250,000 plant at Marcus Hook, Pa., on the Delaware River. The company will make a specialty of asphaltic road oil.

The Chicago Steel Tape Co., of Chicago, Ill., has issued a small booklet describing its line of steel tapes, marking pins, leveling rods, targets, lining poles, stadia rods and stadia targets. The booklet is 4x6 in. in size and consists of 32 pages and covers. It is printed in red and black and is profusely illustrated.

The E. I. du Pont de Nemours and associated companies, the Du Pont Chemical Works, the Du Pont Fabrikoid Co., The Arlington Company, and Harrisons, Inc., have just issued a small booklet containing a list of all the products manufactured by the several companies. The booklet is 3x6 in. in size and consists of 8 pages. It is printed in black and orange and is illustrated by a view of the Du Pont executive offices at Wilmington, Del., and the factory at Newburgh, N. Y.

The Ball Engine Co., of Erie, Pa., has recently issued a book of specifications of the Type B Erie Shovel. The book is 8½x11 in. in size and consists of 12 pages and covers. The contents comprise a detailed description of the Type B shovel, illustrated by numerous halftones and line drawings. The book is especially well printed on heavy white paper and is bound in gray covers. The illustrations include a drawing showing a general arrangement of the mechanism of the shovel, reproductions of photographs showing the shovel in use and illustrations showing various parts of the machinery.

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The Outer Belt Drive, a 120-Mi. Road in Wayne County, Michigan, has been completed. The road is a part of the concrete highway system of the county which has a length of 350 mi.

The State of Nevada will construct a highway across the Great American Desert, connecting with the transcontinental route in Utah on the east and California on the west, at a cost of $160,000, according to report.

The Pennsylvania State Highway Department has recently held conferences with delegations seeking to secure the improvement of roads in several counties. One of the meetings related to the road leading from Harrisburg to New Cumberland in Cumberland; another to 2 mi. of war emergency road in Blair and Cambria Counties, and another to the freeing of the Donegal Pike in Westmoreland County. Commissioner O'Neil promised the assistance of the department in furthering the projects.

GOOD ROADS

A Weekly Journal of Road and Street Engineering and Contracting

Old Series, Vol. LII.
New Series, Vol. XIV.

NEW YORK, OCTOBER 27, 1917

Number 17

Highway Problems in New York State—IV*

By H. ELTINGE BREED†

Use of Suitable Materials

The more we study the results of past highway work, the more strongly do we emphasize the importance of materials as a factor in success, both in respect to durability and to economy in construction.

We have amplified our former material surveys and have made many special examinations in order to have exact information in regard to materials and their sources of supply. We have tried rather to take the burden than to throw it upon the Court of Claims as has been done on account of ambiguity in specifying materials. We have tried to comprehend this phase of our work so thoroughly that we could revise our specifications with greater comprehension that would preclude all possibilities of misunderstanding. We have applied this study of materials to every practical method of design that would show a saving in the ultimate cost of construction work. We have made many material surveys on proposed roads for the purpose of estimating and providing the type which we believe will be not only adequate but remain equal to the additional traffic invited by the improvement. We have, of course, been influenced when selecting the type not only by the first cost of construction, but also by the cost of maintenance and renewal. We are today carrying on continuous inspections on highways under construction with more cooperation and better understanding from the individual engineer on the work than ever before. The efficacy of this material inspection is shown not only by the high quality of the completed roads, but also by the fact that during the year there were rejected approximately 3,000 cu. yd. of stone, 1,125 cu. yd. of slag, 125 cu. yd. of gravel, 1,450 cu. yd. of sand and 100 cu. yd. of screenings. So many rejections of dirty materials have made the sources of commercial supply realize that they must furnish us with what our specifications require.

We must have a more durable type of construction in many sections of the state, and we must have it at reasonable cost. The concrete road is durable and economical so we have been specifying a large amount of it. In order that this type of pavement be successful, it is necessary

EMPLOYEES OF THE TESTING LABORATORY OF THE NEW YORK STATE HIGHWAY DEPARTMENT DRILLING ROCK TO OBTAIN TEST CORES.

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*Part of a paper read before the Albany Society of Engineers, Albany, N. Y., April 24, 1917. The previous installments of this paper were printed in "Good Roads" for Oct. 6, 13 and 20; this installment completes the paper.

†First Deputy Commissioner, New York State Commission of Highways.

that the sand used in the concrete come up to certain standards, and we are far more particular today about its qualities than we are even about the cement.

In providing tests for our materials we have tried to inject the element of judgment into all our problems. We are, therefore, making different field tests which closely approximate those made in the laboratory, so that the value of our laboratory work may be significant to the man in the field and so that its results may be checked up by him. Success of work depends upon the field man; in every case his personality helps determine the results. Put him in line with your tests, practices, etc., and his interest and co-operation will show most profitably in the work. We are gradually instructing all our men in all the tests and methods of inspection so that they may at all times be in touch with the suitability of the materials for any given class of work, and we believe that our best results may be attributed to the esprit de corps engendered by this method. The great importance of this is evident when we realize that nature never has any two deposits of any kind exactly alike; the field man must perceive fine distinctions.

Ability to Get Contractors and Laborers

The department this year has worked with an energy and an enthusiasm that have overcome many of the obstacles that have impeded us. Some were beyond it, the scarcity of labor; the lack of supplies; the reluctance of contractors to undertake work with materials and workmen constantly increasing in cost and growing uncertain at any price; the inefficiency of such labor as could be obtained; and the caution of bonding companies in assuring new work.

So potent were these factors, so alarming the failure of many contractors, that during the latter part of 1916 we advertized carefully prepared contracts for which we received not a single bid. Obviously we could not go on with the work.

The average increase for 1916 in prices bid for those items covering chiefly the cost of labor was 30%—for other items composed chiefly of materials the increase was from 10 to 20%. The result has been that many contractors who had carried over work from the previous year, bid in before the rise in the material and labor market, went into bankruptcy, abandoned their work and left many miles of highway torn up, in such shape that the people complained.

Of course, we have looked to the bonding companies for the completion of such contracts, but in some cases, in order that the public could have the use of highways, it has been necessary for us to do the work with our own forces. It is true that the bonding companies have shown no alacrity in shouldering the contractors' burdens. They have resorted to every legal evasion and technicality which they could utilize, and it finally became necessary for the Attorney-General to bring suit in several instances before the bonding companies could be brought to realize that their liability extended beyond the collection of a premium from the contractor. The silver lining to this cloud is just becoming visible. Bonds are no longer written for every Tom, Dick and Harry. These companies now require of a successful bidder actual assets which are commensurate with the size of the work and the price bid for it, as determined by the engineers for the surety company. Some of these low bidders have been unable to procure bonds, with the result that bids have been rejected and the certified check of the bidder seized. So you can see that by the elimination of the unfit, not only the state and the traveling public will be benefitted, but also those contractors who have ability to procure and carry through their work.

Special Work

Southampton Contract.—We have one contract in the state where there has been no shortage of labor—no strike—a flat wage scale of $2 per day for 1915, and $2.25 for 1916. No complaints have been received except from the State Labor Commission. It presents so many unusual features that I want to tell you about it.

In the latter part of 1914, the Town of Southampton on the eastern end of Long Island, was the low bidder on an 11-mi. concrete highway. All sorts of direful predictions were made for them—it was intimated that here would be a haven of rest for material and machinery agents, and that the town would buy enough plant to build three roads. But the calamity howlers were disappointed. The town appointed a general superintendent, giving him free rein—a roller was purchased, a pipe line, a mixer and small tools—the cement was contracted for the life of the work—a contract was executed with the owner of a dredge to furnish washed sand and gravel. The work began in 1915, and fair progress has been made ever since. About 7 mi. have been completed in a very satisfactory manner. The first unusual happening was that the town decided that a 20-ft. road would please them better than a 16-ft., as per contract—so they requested permission to add 4 ft. without extra cost to the state. The commissioner merely gasped and said, "Bless you, my children."

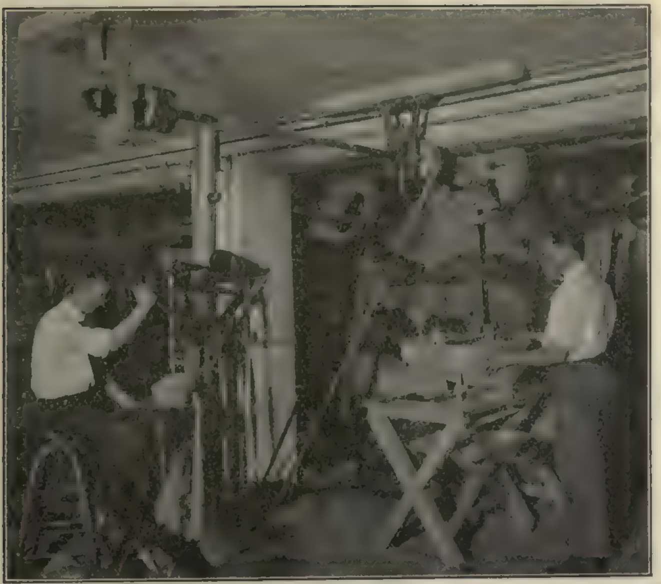
They work only eight hours—everybody works—young boys (that was where the Labor Commission kicked), their fathers and even their grandfathers. A bus takes them to work and home again. The sand and gravel is kept ahead—the cement never runs out—the mixer is washed clean every night—the force is paid off every two weeks. I won't say that they kill themselves working or that the general progress is unusually rapid—but, gentlemen, what difference does it make? Every laborer in the town has a job that wants one; the progress is fair; the quality of work equal to any in the state; and the wages are spent right in their own town so that they are really paying part of their own salaries and getting a good road thrown in. * * *

SAND DEPOSIT IN WHICH EMPLOYEES OF THE NEW YORK STATE HIGHWAY DEPARTMENT'S TESTING LABORATORY ARE DIGGING TEST PITS.

The Engineer

In conclusion, I want to turn from my subject and say a few words, if it will not tire you too much, about the engineer himself. Not to express the sentiment of one of our profession when he said: "God bless the taxpayer; long may he stand for us," but in rather a more serious vein.

First, let me speak for a minute about the highway engineer. To a large majority of the taxpayers he was for a long time a joke, good enough perhaps to add the frills



MAKING ABRASION TEST ON STONE—NEW YORK STATE HIGHWAY DEPARTMENT LABORATORY.

for such communities as had money to waste, but considered as a luxury. The statement was common that anyone could build a road. However, owing to the good pioneer work done by the bicycle clubs and the automobile associations, the people at last seemed to realize that if road building was to progress it must, like all undertakings, be treated from a scientific standpoint in such a manner that the best results could be obtained, and so different organizations were formed and different highway departments were organized to carry on the work. The results speak for themselves, and today the profession of highway engineer carries with it a standing that I think the other branches of the profession are proud of. This result is largely due not only to the work in the field, but also to the cooperation, interest and work of some of our universities and the cooperation, influence and recognition of the men of our own profession.

It may be interesting to know that in 1828, Thomas Tredgold, in England, defined civil engineering as "the art of directing the great sources of power in nature for the use and convenience of man." While this definition was incorporated in the constitution of the Institution of Civil Engineers of Great Britain, it does not come as near hitting the nail on the head as that given in 1885 by A. M. Wellington, who was a prominent American engineer, for many years editor of "Engineering News." He said: "Engineering is the art of doing that well with one dollar which any bungler can do with two after a fashion."

TESTING PAVING BRICK—NEW YORK STATE HIGHWAY DEPARTMENT TESTING LABORATORY.

Then there is a third definition given of the engineer by some unknown person which is amusing and has more truth than poetry in it: "An engineer is a compound of common sense and mathematics. If he has not enough mathematics, his lot in life will be a hard one; if he has not enough common sense, God pity him."

It will probably be interesting to you to know that the first school to teach the profession of civil engineering as such, with the degree of civil engineer, was the Rensselaer Polytechnic Institute at Troy, founded in 1826. It is believed that the second civil engineering school was established in France a year or two after the establishment of the Rensselaer Polytechnic Institute, although the famous Ecole des Ponts et Chaussees, for the training of engineers to care for the French highways was essentially a civil engineering school. Between 1830 and 1840, the University of Glasgow took up the work of training for civil engineering, and the fourth school of engineering to be established was Union College, now Union University, Schenectady, N. Y.

One of the definitions of an engineer I have given applies to one main essential in his successful career, and that is vision. He must not only be able to plan and execute, have good judgment and construct, but he must have vision enough to see the future and provide for it. Dean Smith of Cornell said in his tribute to ex-President White the following:

"Some men who see rare visions rest content
To see them and to let them fade away.
Not so for him; to him the vision meant
The call to toil to make the vision stay."

This, I take it, applies as well to the engineer as to any man of ideals who by action makes them real. To us, courage and conviction are always essential for we are forever working ourselves out of a job by striving for the completion of the work in hand. While for all of us it is a gainful occupation, our real pay comes in the zest of achievement. We know that we are producers who have a part in the big things of life.

Good Roads and What They Mean*

By JOHN I. GIBSON†

The world is looking upon peoples and things from the standpoint of assets and liabilities, not figuring solely from a money basis, but with the idea of an adequate return from an investment, whether it is in brains, brawn or money. The returns must be in any one of the thousand and more things which go to make up the sum total of that which we are all seeking, viz., happiness.

The automobile has demonstrated to the farmer and business man that their aims and ideals are one and that their social and financial interests are identical; that they are linked together in a common cause and that cause is the general betterment.

The business man knows it is to his interest that the farmer be prosperous and happy; that the better the farms in his range of operations, the better his business will be. The farmer knows that a large and prosperous community within his range is an advantage to him. They are assets to each other and are a mutual investment. The longer the range of the farmer becomes the greater is this asset to him; the longer the range of the business man the more valuable is the asset to him.

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*From an address on Michigan Goods Roads Field Day, Cass City, Mich, August 24, 1917.

†Secretary, Western Michigan Development Bureau, Grand Rapids, Mich.

What makes this range? What is the link connecting the two? Good roads! And the better the road, the larger the investment and consequently the greater the asset. * * *

Progressive railroad men are free to say that they see the increased prosperity which the railroads derive from good roads. Improved highways mean more regular distribution of freight traffic throughout the year, besides, they increase the amount of territory the railroads can draw on. In other words, and this is something the farmers of Michigan are beginning to see, the profitable farm land comprises a strip of land on either side of the railroads. The wider this strip is made, by the building of good roads, the richer and more profitable the territory becomes to the carrying companies.

Good roads cut distance in half. A farm 20 mi. from a railroad is brought within 10 mi. by the means of good highways. * * *

Good roads invariably increase the prosperity of the farming communities by enabling the farmer to haul his crops to market when most convenient and when the state of the market warrants, and not merely when the condition of the road will permit.

Good highways greatly increase the haulage, and at the same time are the means of reducing the wear and tear on harness, wagons, etc., very materially. The farming communities where the wagon roads are good and the means of communication easy, are invariably the most prosperous and up to date.

As a factor in increasing the country school attendance good roads are well worth while. Investigation shows an increase in the average school attendance of from 59 in 100 to 78 in 100 in districts where the roads are improved, as against 5 in 100 where bad roads are the rule.

Good roads, combined with increased wages and better working conditions for farm help, will go a long way towards combating the exodus from the country to the city.

An attempt has been made, with some success, to discourage the building and maintenance of roads while the war lasts. This is a mistaken policy, for the reason that good roads are more necessary now than in times of peace, because of the urgent necessity which war forces on the country of moving troops, food and material safely and quickly.

It was the splendid highways of France that saved the day, and forced the German retreat at the Marne by enabling General Gallieni to send reinforcements quickly from Paris by automobile. * * *

Good roads tend to annihilate distance; they transform the waste places to fertile fields; they result in better farms and more cultivated land, better crops and cheaper transportation, more and better schools and larger attendance, better health and prompt medical attention, more neighborliness, and better rural social conditions, and conduce in no small degree to "better farming," "better business," and "better living."

Railroad Grade Crossings Within Municipalities[*]

By **MAX THELEN**[†]

The subject of railroad grade crossing, their protection and their elimination, is nation-wide in scope. Important as the problem has been in the past the increasing congestion of population and traffic in our cities, and particuraly the stupendous increase in the use of motor vehicles, are at present challenging the earnest attention of our people in all sections of the United States and imperatively demanding intelligent and constructive action.

In a number of instances the problem is being worked out by the local authorities, unaided by the state.

The general consensus of opinion, however, is that the problem is a state problem and that the state itself should take the lead and, in appropriate cases, bear a part of the financial burden. Within the last few years statutes have accordingly been enacted in New York, Pennsylvania, Massachusetts, New Jersey, Illinois, Wisconsin, Indiana, Missouri and many other states of the Union, establishing a state policy with reference to the protection and the elimination of dangerous railroad grade crossings. These statutes generally provide that the state railroad or public service commission shall have jurisdicton over such crossings, with power to provide for their protection and to compel their elmination with either a fixed or a flexible sharing of the expense of elimination between the railroads and the public authorities affected.

In California state action on this subject was first taken in the so-called Stetson-Eshleman Railroad Commission Act, effective February 9, 1911. Section 15 of this act provided substantially that the railroad commission should have the exclusive power to prescribe the place and manner of all railroad grade crossings, to provide for their protection, to require separations of grades, and to determine in connection with grade separations the proportions in which the expense of installing and maintaining such crossings should be divided between the railroad company and the county or other public authority in charge of the public highway, if any, affected.

The Public Utilities Act, effective March 23, 1912, continued these provisions and added thereto a specific direction that no railroad grade crossing should thereafter be constructed unless the railroad commission's consent should first have been secured. The act also provided that the commission might apportion a part of the expense of the elimination of dangerous railroad grade crossings to the state as well as to the railroad or street railroad corporations and the county, municipality or other public authority in interest.

The authority conferred by the Public Utlities Act, with reference to railroad grade crossings, has been vigorously exercised by the railroad commission in protecting existing crossings and in refusing to authorize new grade crossings unless greatly needed and properly protected.

Early in 1916 the commission, on its own motion, instituted a formal investigation into the safety of each of the more than 10,000 railroad grade crossings in the state. After preliminary public hearings the commission's engineering department was instructed to inspect and report upon each individual crossing. The engineering department makes its recommendations to the railroad and to the public authority affected, suggesting such action by either or both parties as seems appropriate to insure greater safety at the crossing. These investigations have been carried on within the incorporated cities and towns of the state, as well as in unincorporated territory, except that in the City of Los Angeles the work has been deferred at the suggestion of the city authorities by reason of their belief that the jurisdiction in this matter vested in the city and not in the railroad commission.

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[*] Paper presented at the annual convention at the League of California Municipalities, Santa Rosa, Cal., Sept. 24-29, 1917.

[†] President, California Railroad Commission.

Up to June 30, 1917, the commission's engineers had inspected 5,300 crossings, rendered 4,785 reports, one report frequently covering a number of crossings, and made 3,000 recommendations for greater safety. Of these recommendations over one-half have already been carried into effect by the railroads and the local public authorities. The commission is hopeful of being able to complete this survey within another year.

The elimination of dangerous railroad grade crossings, either by closing the crossing or by separating the grades, presents the most difficult problem in connection with the railroad commission's jurisdiction over railroad crossings. It has been roughly estimated that there are 4,000 railroad grade crossings in the incorporated municipalities of California, and that the elimination of all these crossings by separation of grades would cost more than $100,000,000.

The difficulties which have confronted the railroad commission in the elimination of railroad grade crossings have been partly legal and partly financial.

In the City of San Jose case the commission authorized the Southern Pacific Company to construct its main line railroad along a proposed new right of way, involving thirty-five crossings of public streets or highways. The commission authorized all these crossings at grade, with appropriate safety devices, where necessary, except the crossing of "The Alameda," where the commission provided that there should be a separation of grades, the expense of such separation to be shared by the railroads and street railroads and the public authorities affected, including the City of San Jose. The city took the case to the State Supreme Court on writ of review, there contended, earnestly and ably, that the provisions of the Public Utilities Act authorizing the railroad commission to apportion to the city affected a part of the cost of eliminating a railroad grade crossing are unconstitutional. The Supreme Court, by decision rendered on June 4, 1917, held that such apportionment of expense is cognate and germane to the regulation of railroads by the commission. The court squarely decided that these provisions of the Public Utilities Act are constitutional and that the railroad commission may lawfully apportion to the public authorities affected a part of the cost of the elimination of railroad grade crossings.

Later, in the City of Los Angeles case, the city conceded before the Supreme Court that the railroad commission has the exclusive jurisdiction over the construction of union railroad depots in Los Angeles, but urged that the construction and operation of railroad tracks in the municipality is a matter over which the city authorities have sole jurisdiction. The railroad commission took the position that the construction and operation of state railroads is a state affair and not a municipal affair, and that the exclusive jurisdiction thereover vests in the commission. The Supreme Court, by decision rendered on June 11, 1917, squarely sustained the railroad commission. The court also repeated its pronouncement in the San Jose case that the commission has the power to apportion to the public authorities affected a part of the expense of separating railroad grade crossings. The City of Los Angeles filed a petition for rehearing on this point and a number of other matters, but the petition was denied.

These decisions have very much clarified the situation and have definitely established, among others, these two propositions:

1. That the railroad commission has exclusive jurisdiction in all parts of California over the construction and operation of state railroads.

2. That the railroad commission has power to apportion to the public authorities affected a part of the expense of eliminating dangerous railroad grade crossings.

In view of the very great importance of this subject and the certainty that proceedings involving the expenditure of millions of dollars in the elimination of dangerous railroad grade crossings would shortly be filed, the commission drafted and presented to the last Legislature a bill making more effective the procedure before the railroad commission in cases of this character and providing that all the issues might be determined by the commission in a single proceeding without the long delays which would ensue from collateral proceedings in the courts. This bill was enacted into law as Chapter 209 of the Laws of 1917.

The act amends Section 43 of the Public Utilities Act in two important respects:

1. It provides the procedure to make effective the commission's power to apportion among the railroads, street railroads and public authorities affected the cost of the alteration or separation of railroad grade crossings.

2. It enables the railroad commission to determine in the same proceeding and as part thereof the just compensation to be paid for all property taken or damaged in the separation of railroad grades at any crossing, or in the construction, alteration or relocation of elevated tracks or subways for any railroad or street railroad, or of public streets over or under railroad or street railroad tracks.

The matter just referred to is of very great importance. The railroad commission will undoubtedly be called upon to work out constructive solutions of railroad problems affecting entire cities. It may well be that the perfected plan results in some vital portion thereof in the taking or damage of property of third parties. In the absence of the amendment, which was enacted at the request of the commission, the consummation of a plan covering an entire city might conceivably suffer long delays, perhaps a number of years, until the parties had litigated in the courts the question of the compensation to be paid for property thus taken or damaged. Under the procedure provided by said Chapter 209 the railroad commission itself may fix the compensation for such property. From the commission's determination a review lies only to the Supreme Court and solely on the question of jurisdiction. Thus a single tribunal will dispose of all the issues. It is the commission's earnest hopes that these proceedings may be characterized by efficiency and finality.

The legal doubts having been swept away and an efficient procedure having been established, the railroad commission now looks forward to the future and hopes very earnestly, that it may be of service in doing constructive work in the solution of our serious railroad crossings problem. We realize fully the tremendous importance of safeguarding the lives of our people and also the very serious consideration which must be given, from the point of view of all the parties, to the question of expense. The full accomplishment of what must be done will take years, perhaps a generation or more, but we should not be discouraged by the enormous expense and the length of time involved. We should proceed promptly to the work, giving attention first to the most dangerous situations and thereafter gradually considering the others.

The protection of existing dangerous grade crossings has already been ordered in most instances, but no number of wigwags or flagmen will ultimately solve the problem. The only final solution is complete abolition.

In this work the railroad commission is confident that it will receive the hearty cooperation and support of all the cities and other public authorities. The extent to which the cities have already cooperated in such matters as trimming trees near railroad crossings, advance signs, removing billboards, closing unnecessary grade crossings, improving street approaches and making street approaches and making street changes has been most gratifying to the commission, and I now make public acknowledgment to the cities for their cordial and effective assistance. With a continuation of this cooperation we may all look forward to splendid constructive work for the greater happiness and safety of the people of California.

Highway Legislation in New York

Included in the work of the New York State General Assembly at its 1917 session was the passage of a "general highway traffic law" and a motor truck and trailer law. These were printed in more or less detail in previous issues of "Good Roads." [See "General Highway Traffic Law of New York," "Good Roads," July 14, 1917; "New Motor Truck Law Passed in New York State," Feb. 10, 1917; "Trailer Law in New York State," Sept. 15, 1917.] Other laws passed or amended by the Assembly this year relate to federal aid, county liability for injuries caused by defective highways and bridges, convict labor, apportionment of mileage of state highways to be constructed or improved, alternative method of apportioning the expense of county highways, the acquisition of toll bridges at the expense of the state, and minor features of highway administration.

Provision for the acceptance and application of federal money was made in the following manner:

Section 161. The state commissioner of highways is hereby authorized, empowered and directed to designate the public highways or portions thereof, outside of cities, which, in his discretion, he may deem proper to be improved or constructed as cooperative roads with the moneys to be appropriated by the State of New York and the moneys contributed to the State of New York for highway improvement by the federal government under the provisions of an act of Congress entitled "An act to provide that the United States shall aid the states in the construction of rural post roads, and for other purposes," approved July 11, 1916; provided that the highways or portions thereof thus designated shall form a portion of the system of state or of county highways as provided by this chapter, or shall form a connection between state, county and federal highways duly authorized by law of this or any other state or nation, for the purpose of aiding in the completion of the system of improved highways of the United States of America. The highways thus designated shall be tentatively indicated on a map to be prepared by, and filed in the office of, the state commissioner of highways; and a duplicate thereof shall be filed in the office of the secretary of state of New York State on or before the 15th day of May, 1917; subject, however, to such modification as may hereafter be submitted by the state commissioner of highways and approved by the United States secretary of agriculture in accordance with Section 1 of the act of Congress hereinbefore referred to. The designations indicated on such map are dependent, however, on provisions being made by the governing boards of the political subdivisions of the state for the improvement of such other highways as are deemed necessary, in the opinion of the state commissioner of highways, to complete the combined highway system of the state.

Section 162. Preliminary surveys, plans, specifications and estimates of cost for the highways or portions thereof so designated shall be made by the state department of highways in the same manner as prescribed in Section 125 of the highway law, and the expense thereof shall be paid out of the moneys appropriated by the state for the purposes of this article.

Section 163. After the submission to, and approval by the secretary of the United States department of agriculture, of such plans, specifications and estimates of cost, as required by the provisions of said act of Congress, the same shall be approved by the commissioner of highways by executive order; which order shall give a consecutive number to the highway a portion thereof covered by said plans. A certified copy of such order shall be filed with said secretary of agriculture and with the state comptroller. Roads shall be taken up for construction or improvement in the order of final approval unless the commissioner of highways deems otherwise advisable, in which event an executive order shall be filed in the office of the highway department giving the reasons for deviating from such order, and a certified copy thereof filed with said secretary and with the state comptroller.

Section 164. The form of proposal, contract and bond, the method of advertising for proposals, the rejection of proposals, the award of contracts and the payments to contractors shall be governed by the provisions of Section 130 of this chapter. To expedite the payment of the share of the federal government as shown by monthly estimates rendered on existing contracts as provided herein it is hereby provided that upon the filing of the report of the commissioner of highways with the legislature, showing the amount of construction under federal aid contemplated for the ensuing year, and in case an appropriation is made by the legislature to provide the state's share of the construction shown in such report, there shall also be appropriated such an additional amount as is necessary to pay in the first instance the share of the federal government of the cost of such work. Itemized statements showing the entire cost of construction of such roads shall be rendered by the commissioner of highways to the state comptroller and the federal government as the work progresses and such statements shall show the subdivision of cost between the state and the federal government, and shall be accompanied by drafts on the federal government for the amount of its share of such cost. Upon the payment of such drafts the proceeds shall be deposited by the commissioner of highways with the treasurer of the state for the purpose of reimbursing the appropriation made by the state on account of such advance payments, and upon the final completion of the work a report thereof filed with the state comptroller. The provisions of Sections 77 and 160 of this chapter, relative to closing highways for repair or construction and the maintenance of detours during construction; also the provisions of Section 132 of this chapter relative to the authority of the commissioner to secure the completion of the work; also the provisions of Sections 135 and 136 of this chapter, relative to the entry upon adjacent lands for drainage purposes and the payment of damages for such entry; also the provisions of Sections 137, 138 and 138-a, relative to construction in villages and to additional width and increased cost; also the provisions of Section 146 of this act, relative to the issuance of permits for work by persons, firms or corporations; also the provisions of Section 156 relative to the application of the labor law; shall all be applicable for the purposes of highways improved or constructed under the provisions of this article. The provisions of article 7 of this chapter relative to the maintenance of state and county highways shall apply to the maintenance and repair of highways improved or constructed under the provisions of this article. All contingencies arising during the prosecution of the work shall be provided for to the satisfaction of the commissioner of highways and as may be agreed upon in the original or by a supplemental contract executed by the commissioners. If a supplemental contract be executed for the performance of work or the furnishing of material not provided for in the original contract, the amount to be charged thereunder for any such work or materials shall not exceed the rate for which similar work or material was agreed to be performed or furnished under the original bid upon which the contract was awarded. Any work necessarily required for the proper completion of the contract and for which no item price bid was contained in the proposal shall be performed upon prices to be agreed upon by the contractor and the commissioner prior to the performance of such work, and such work and the prices therefor shall be provided in a supplemental contract. The total amount to be expended in the improvement or construction of a highway or section thereof shall not exceed the original estimate, unless such estimate shall have been duly amended by the commissioner with the approval of the secretary of agriculture.

Section 165. Upon the completion of a highway or section thereof constructed or improved under the provisions of this article, the division engineer shall inspect the same and shall report in writing to the state commissioner of highways his recommendation as to whether or not the contract should be finally accepted, and the decision of the said commissioner, which shall be conclusive, as to the acceptance of said highway or portion thereof thus constructed or improved, shall be entered in the form of an executive order, a certified copy of which shall be filed with the secretary of agriculture.

Section 166. The provisions of article 6 of this chapter relative to the acquisition of lands for right of way and other purposes shall be applicable for the purposes of highways improved or constructed under the provisions of this article.

Section 167. The proportion of the total cost of the improvement or construction of highways to be borne by the State of New York under the provisions of this article, exclusive of the expenses incurred prior to the beginning of construction work, for the purposes of making surveys, plans, specifications and estimates of cost, shall not exceed 50% of such total cost.

Section 168. The state commissioner of highways is hereby authorized, empowered and directed to perform and do such other and further acts not hereby specifically provided in this article as may be necessary to conduct the improvement or construction of cooperative highways with state and federal aid in compliance with the act of Congress hereinbefore referred to and the rules and regulations promulgated by the secretary of agriculture under authority conferred upon him

(*Continued on page 224.*)

GOOD ROADS

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

OCTOBER 27, 1917

RESPONSIBILITY AND AUTHORITY

One of the most serious bars to economy and efficiency in any line is the failure to delegate to those responsible for given work sufficient authority for the performance of that work. This is nowhere more strikingly demonstrated than in road work, where it is so frequently necessary to make allowances for local conditions which can be understood by no one as well as by the man on the job.

In order to get results from any organization, every man in it should be vested with adequate authority to enable him to meet the responsibilities put upon him. In a state highway department, for example, this should hold good for every member of the commission and its staff and for every employee having any degree of responsibility, from the commissioner or commission down through the organization to the inspector on a single job or part of a job. Any other plan can result only in confusion, divided responsibility, lack of team work, and, in the end, failure to get the work done in the best and cheapest way.

Yet the laws of many states fail to give highway authorities the necessary power, and the administrative heads of some highway departments fail to delegate to subordinates the authority they should have in order to carry the responsibilities imposed upon them.

Attention is called to this very important matter in a letter on "Federal Aid Rules and Regulations," printed elsewhere in this issue. The writer of that letter especially emphasizes the difficulty in securing results experienced by the man expected to produce them when he is hampered by rules and regulations preventing the exercise of his ability and judgment. He points out the fallacy of the theory that ability and integrity can be obtained from an incompetent and dishonest man by confining his activities within limits set by rules, and urges the selection of competent, conscientious men and their employment under conditions that permit them to exercise their discretion.

This, of course, is not the advocacy of an entire absence of control over the actions of subordinates, but merely an argument for a freedom of action sufficient to make possible such supervision of work as will bring the best results—in other words the delegation of authority commensurate with the responsibility delegated.

The job of building and maintaining the roads in an entire state or in any one of many counties in this country is too big for any one man to undertake unless he is able to transfer to his subordinates the responsibility for some parts of it. These men, in turn, must put upon their subordinates lesser responsibilities, and this shifting of responsibility must be continued until the particular part of the work in charge of any individual is small enough so that he can handle it alone. In an efficient organization this is done, and with each transfer of responsibility there is also a transfer of enough authority over subordinates to make possible the efficient performance of the task set for the individual.

The success of any highway department—national, state or county—depends upon the character and ability of the men in it and upon their working together without friction, divided responsibility or conflicts of authority. Character and ability in individuals can be assured by careful selection. Team work can be assured by proper organization, one of the fundamental principles of which has been set forth.

BUILDING ROADS WITH BOND ISSUE MONEY

An important point in connection with the building of roads paid for from the proceeds of bond issues was made by Rodman Wiley, Commissioner of Public Roads of Kentucky, speaking before the Southern Commercial Congress at New York last week. Referring to the voting of bonds in Kentucky counties, he said that about one-fourth of the counties in that state had voted bonds "and voted arbitrary amounts without giving due consideration to the fact that the bond issue was, in most cases, insufficient in amount to make the expected improvement."

Such procedure, as pointed out by Commissioner Wiley, results in disappointment when it is found that the sum realized from selling the bonds is inadequate, and future proposals to bond the county are not supported.

This is another example of the all too common failure to apply business principles to public work. If those in active charge of a private enterprise decided that improvements were necessary, they would be pretty sure to ascertain just what was needed and its cost before going before the directors to ask for the necessary funds. The same method should be followed in the case of a county needing better roads. As stated by Commissioner Wiley in the address to which reference has been made ["The Good Roads Movement in Kentucky," "Good Roads," Oct. 20, 1917, page 208], the roads to be improved should be designated, accurate surveys and estimates made, and the amount of the bond issue fixed accordingly.

When this is done, when the roads in the system are properly designated with reference to the needs of the county, when the types of roads are selected wisely, and when the actual construction work is done well and economically, it will be possible to carry another bond issue, if another is necessary. If these things are not done, future bond proposals can be expected to meet with very determined opposition.

◆

Charleston County, South Carolina, has passed a bond issue of $275,000 to be used toward the development of a permanent highway system for the county. The issue was carried by a vote of 6 to 1.

The Connecticut State Highway Commission had an unexpended balance of $340,266.91 on hand at the close of the fiscal year ending Sept. 30, 1917. Only $11,418.87 of the amount is turned over to the state treasury. The remainder added to legislative appropriations of more than $7,000,000 produces upward of $7,340,000 for use in the next two years.

Highway Legislation in New York

(*Continued from page 222.*)

> by said act of Congress, the provisions of which act are hereby assented to, the good faith of the State of New York being hereby pledged to make such provision from time to time as may be necessary to provide its share of the cost of the improvement of such highways.

A provision added to the laws this year makes a county liable for injuries to persons or property caused by defective highways and bridges, when the county has charge of the repair of maintenance of a road, bridge or culvert. A written claim for damages containing full particulars as to the time and circumstances under which the injuries were sustained must be served upon the county clerk or chairman of the board of supervisors within three months from the time of the accident, but civil action upon such claim may not be commenced until the expiration of three months after the service of the notice.

The revised law relating to the mileage of state highways to be constructed or improved from funds available from the state bond issue requires that it be apportioned by the State Highway Commission among the several counties without discrimination, but that not more than one-half of the yearly appropriation from such money shall be used for state highway construction and improvement. In making the apportionment, consideration must be given to "the mileage which may be constructed from the amount to be expended under this article in each county for the construction or improvement of county highways, together with the mileage of state and county highways theretofore constructed out of moneys derived from the sale of bonds issued as above provided." Where funds are not sufficient for the improvement of any portion of a state route, it may be improved as a county highway, if so designated by the board of supervisors.

Section 141-a of the highway law provides an alternate method of apportioning the expense of constructing or improving county highways. The law formerly provided that in no case should a county pay more than 35% of the expense, but as amended, the board of supervisors may upon resolution assume for the county 50% of the expense of constructing or improving a county highway, and in case a town within the county has already paid or has become liable for 15% or less of the cost the amount may be returned by the county to the town, and a tax levied to meet the expense, if the money in the county fund is not available therefor. The established division of the expense of constructing county highways through or into cities of the second and third class is 50% to the state, 35% to the county, and 15% to the town or towns within which the roads are located.

The cost to the town for the maintenance and repair of state and county highways is $50 a year for each mile or major fraction thereof ,of the total mileage of such highways within the town; the cost to incorporated villages is 1½ ct. per sq. yd. of surface maintained by the state.

The state is now required to maintain a road improved by state appropriation under special laws. If it is properly constructed and sufficiently important, the commissioner of highways may order that the road be added to the system of state or county highways.

The New York law applicable to the employment of convicts on the public highways, as amended in 1917, reads as follows:

> The superintendent of state prisons may employ or cause to be employed the convicts confined in the state prisons in the repair of state and county highways at any place within the state upon request of the state commission of highways, the construction or improvement of state or county highways constructed or improved by any board of supervisors or town board under a contract with such commission of highways, upon request as provided in Section 131 of the Highway Law, and also in the improvement or repair of any other public highway. When engaged in the maintenance and repair of state or county highways, the department of highways, shall compensate the prison department for such convict labor on a basis of actual days each convict is so employed at a price per day for such employment to be agreed upon between the superintendent of state prisons and the commissioner of highways, such price taking into consideration the efficiency of the convicts so employed and the ruling price for ordinary labor. The department of highways shall report to the superintendent of state prisons, or the agent and warden of the prison from which the convicts are employed, at the end of each week, the number of days' labor each convict has performed, and the prison department shall render a bill to the department of highways at least once each month covering such labor.
>
> Upon the payment by the department of highways of such bill, the agent and warden of the prison rendering it shall immediately deposit the money received for such labor in a bank designated by the comptroller as the depository for the maintenance fund of such prison, to the credit of a separate fund to be called the "prison highway labor fund." A statement of such money so received and deposited shall immediately be sent by the agent and warden to the comptroller and the superintendent of state prisons, which statement shall show the date when such money was received, and shall be receipted by the proper officer of such bank and verified by the oath of the agent and warden of such prison to the effect that the sum so deposited was all the money received since the date of the last deposit from the labor of convicts on highways as provided by this section.
>
> The money so received and deposited by such agent and warden shall be only available for the maintenance, housing, purchase of food, transportation and guarding of such convicts, and any other necessary expense while engaged in such highway work, and shall be subject to the check of the agent and warden of such prison when countersigned by the comptroller in the payment of such accounts. The comptroller shall countersign such checks only when the same are drawn for the payment of vouchers properly chargeable to this fund and approved by the superintendent of state prisons.
>
> On December 31 of each year the agent and warden of such prison shall draw his check in favor of the state treasurer for the balance remaining to the credit of the "prison highway labor fund" at that date and forward it to the comptroller, who shall countersign such check and deposit the same with the state treasurer to be added to the general fund.
>
> The expense of maintenance of such convicts while employed in the improvement or repair of town highways under a special appropriation shall not exceed a rate fixed per diem per convict by the superintendent of state prisons at the beginning of the work, and shall be paid by the agent and warden of the prison concerned from the special appropriation made therefor. Any expense exceeding such fixed rate shall be paid by the agent and warden of the prison concerned from the regular prison maintenance appropriation for such prison.
>
> The agent and warden of each prison may make such rules as he may deem necessary for the proper care, custody and control of such prisoners while so employed, subject to the approval of the superintendent of state prisons.
>
> A state, county or town highway herein referred to is a state, county or town highway as defined in the highway law.
>
> The superintendent of state prisons is hereby authorized to purchase any machinery, tools and materials necessary in such employment, except employment on a state or county highway.

In the acquisition of toll bridges at the expense of the state, the board of county supervisors takes initial action by resolution. To be so acquired a toll bridge must constitute a connecting link between two state routes, or a part of a state route, and be of sufficient importance to public interest. After the preliminary work of the board of supervisors in estimating the probable cost of acquiring the bridge is completed, the transaction is executed by the State Commission of Highways.

Minnesota's 1918 Road Building Program

Plans for road building in Minnesota during 1918 are being worked out by the State Highway Department. According to present plans, the regular road building program will be carried out, and in addition there will be the work on federal aid projects.

The amount available from the federal funds is $425,865.40.

A special law passed by the Legislature permits the counties to make extra levies for federal aid projects. Under this law, counties can levy a 5-mill tax on a valuation up to $10,000,000, 3 mills on a valuation from $10,000,000 to $25,000,000 and 1 mill on a valuation over $25,000,000. Commissioner Babcock has discussed this extra levy with a number of county commissioners from different parts of the state, and, without a single exception, these local officials have been in favor of carrying out the regular road building program and making the extra levy where federal aid is apportioned.

Apportionments are being made by Commissioner Babcock only to those counties which are making special levies.

The Recently Appointed State Highway Commissioner of Pennsylvania

J. Denny O'Neil, of McKeesport, Pa., who was appointed State Highway Commissioner of Pennsylvania by Governor Brumbaugh on Sept. 6, 1917, was born in Elizabeth, Allegheny County, Pa., in 1866. He received his education in the public schools of Elizabeth, starting work early in life. In 1885 he removed to McKeesport, where he engaged in the department store business. His rise in business, financial and political circles was rapid.

He is president of the Union National Bank, the Daily News Publishing Co. and the J. D. O'Neil Co., all of McKeesport. He was also president of the State Merchants' Association and an officer of the Associated Dailies' Association of Pennsylvania.

From 1902 to 1905 he served as Recorder of Deeds of Allegheny County, and from 1908 to 1915 as County Commissioner. On June 23, 1916, Governor Brumbaugh appointed Mr. O'Neil Insurance Commissioner of the state. During the short time he occupied this office, notable work was accomplished by which many fraudulent companies were exposed and driven out of business.

J. DENNY O'NEIL
State Highway Commissioner of Pennsylvania

Commissioner O'Neil has declared his intention of pursuing a vigorous policy in connection with the State Highway Department's work. He has taken hold of the reins of the department at a time when abnormal conditions exist and has many serious obstacles to overcome. In less than six weeks of his administration, however, some important contracts have been let, and it is his expressed intention to link up the important highways of the commonwealth just as rapidly as possible. It is also his intention to better the condition of a large mileage of state roads located within borough limits. The maintenance and repair of trans-state highways during the winter months so that they will be passable at all times for the heavily increased motor truck traffic, is now receiving Commissioner O'Neil's attention.

To Modernize Ancient Highways of Mexico

The Federal Department of Communications and Public Works is planning to rehabilitate and modernize several of the ancient highways of Mexico some of which were constructed at the time of Cortez, nearly 400 years ago, and in certain localities are almost obliterated. In addition to putting these old roads into good condition, the department has adopted plans for the construction of an extensive system of new trunk roads to connect the larger industrial and commercial centers of the country. Several thousand natives have already been put to work on these improvements.

Construction work is now in progress on the highways connecting the City of Mexico with Toluca, with Queretaro, with Puebla, and with Tuxpam. These are, in a manner, semi-cardinal routes. It is announced that President Carranza will soon appoint a government commission to visit the United States for the purpose of obtaining all the data and information possible in regard to the various details of highway construction as generally practiced in this country.

It is said that tentative plans are on foot to treat with tar all of the main highways leading out of the capital and to make them especially adapted for automobile touring and motor vehicle traffic.

Bids Received and Contracts Awarded in Pennsylvania

On Oct. 16 the State Highway Department of Pennsylvania opened bids for the construction of state aid roads in Armstrong, Center and Somerset Counties.

For the 13,007 ft. of vitrified block construction in Manor Township, Armstrong County, Rinehart Brothers, of East Liverpool, Ohio, were the only bidders. The bid price was $131,468.20.

D. E. Keller, of Somerset, Pa., bid $65,742.00 for the construction of 6,675 ft. of vitrified block pavement in Somerset Township, Somerset County. This is a part of the project to connect the Lincoln Highway with the National Pike. The bid was too high, and has been rejected.

Two bids were received for the proposed improvement of 2,454 ft., with vitrified block, in Bellefonte Borough, Center County, as follows: R. B. Taylor, Bellefonte, $28,150.35; Loomis & King, Altoona, Pa., $27,867.60.

No bids were received for the improvement proposed for Morgan and Franklin Townships, in Greene County, which would continue the improvement of State Highway Route 268 from Waynesburg to Rice's Landing, a distance of 18,083 ft.

The call for bids for all of the above work appeared in the issue of Sept. 22.

The contract for the construction of a state aid road, 2,540 ft. long, extending from Scottdale toward Greensburg, in East Huntingdon Township, Westmoreland County, was awarded by the Department on Oct. 19 to Rimonti Galiardi, of Connellsville, Pa., at his bid price of $20,955.80.

Contracts for the construction of five bridges in Erie, Lancaster, York, Montour and Susquehanna Counties were awarded on Oct. 19. The low bidders for the work in all but Erie County were noted in the issue of Oct. 20.

The Erie County contract, calling for the construction of a 36-ft. span bridge in McKean Township, on State Highway Route 258, was awarded to E. M. Love & Son, of Corry, Pa., at the price of $5,199.00. The other awards were as follows:

Lancaster County, Bart Township, 24-ft. span, York Bridge & Construction Co., York, Pa., $3,915.80. York County, Carroll Township, Route 125, double 20-ft. span bridge, York Bridge & Construction Co., $3,463.20. Montour County, Liberty Township, Route 259, 16-ft. span, Walter A. Godcharles, Milton, Pa., $1,606.33. Susquehanna County, Lenox Township, Route 265, 16-ft. span, Seaman, Irwin & Brenneman, Honesdale, Pa., $1,862.60.

Bids received for the bridges proposed for Columbia County, Forest Lake and Brooklyn Townships in Susquehanna County, and for Wayne County were rejected, while bids for structures in Monroe County were held pending further advice from the low bidder, Harry F. Mackes, of East Stroudsburg.

MEETINGS

Calendar of Coming Meetings

Oct. 29-30.—Oklahoma Society of Engineers.—Annual convention, Oklahoma City, Okla. Secretary-Treasurer, H. V. Hinckley, Oklahoma City, Okla.

Nov. 19-20.—National Paving Brick Manufacturers Association.—Annual meeting, Cleveland, Ohio. Secretary, Will P. Blair, 830 Engineers Building, Cleveland, Ohio.

Nov. 19-24.—City Managers' Association.—Annual meeting, Detroit, Mich. Secretary, W. L. Miller, City Manager, St. Augustine, Fla.

Nov. 21-24.—National Municipal League.—Twenty-third annual meeting, Hotel Statler, Detroit, Mich. Secretary, Clinton R. Woodruff, 703 North American Building, Philadelphia, Pa.

Dec. 4-6.—American Association of State Highway Officials.—Annual meeting, Hotel Jefferson, Richmond, Va. Acting Secretary, H. M. Berry, Chapel Hill, N. C.

Jan. 15-17, 1918.—Virginia Good Roads Association.—Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

Georgia Association of County Commissioners

The third annual convention of the Georgia Association of County Commissioners will be held in Savannah, Ga., Nov. 20-21. The headquarters of the convention will be the Savannah Hotel. A large attendance of county commissioners and others is expected. Road construction, financing, prison labor, and other subjects relating to highways will be discussed.

Illinois Highway Commissioners and Town Clerks

The following officers were elected at the recent eighth annual convention of Illinois Highway Commissioners and Town Clerks:

President, William F. Ginter, Joliet; Vice President, E. T. Shoemaker, Kankakee; Secretary-Treasurer, Thomas S. Carlin, Golden. Executive Committee: J. Rufus Kendall, Watseka; Frank Gromes, Aurora; A. C. Johnson, Petersburg.

The meeting was addressed by Representative Richard R. Meents, who introduced and secured the passage of the bill calling for a referendum vote on the proposed $60,000,000 bond issue.

Highway Traffic Association of the State of New York

At a meeting of the Executive Committee of the Highway Traffic Association of the State of New York, held at the Automobile Club of America on Wednesday, Oct. 17, the questions of meetings, voting on discussions, new members and the financing of the association's work were considered. The secretary was instructed to write members of the committee asking them to suggest topics they would like to have considered during the coming season.

Attention was called to the criticism by some members of the association of the custom of immediately voting upon a proposition without proper deliberation. The following resolution was passed:

> Resolved: That the Committee on Revision of the Constitution and By-Laws shall embody in a suitable paragraph a provision to the effect that when any subject is being discussed at a public meeting by the association final action as to their attitude shall not be taken at the same meeting at which the discussion is held. And, if it is not feasible to reassemble the General Committee, the Executive Committee may form a set of resolutions that shall be sent to all the members of the General Committee for their approval or rejection.

The committee also discussed the desirability of selecting for membership men interested in traffic work in different towns and cities, looking toward the possible organization of a local branch. It was decided to continue the present policy of the association in not charging dues to members, and in seeking through the finance committee subscriptions from organizations interested in the work.

Southern Appalachian Good Roads Association

The ninth annual convention of the Southern Appalachian Good Roads Association opened at the capitol in Nashville, Tenn., on the evening of Tuesday, Oct. 16. J. J. Murray, Secretary of the Tennessee State Highway Commission, presided. The official welcome was offered by Governor Tom C. Rye. The President of the Nashville Auto Club, Dr. Charles S. Brown, also extended a welcome to the visitors, on behalf of the club.

In his response, Henry Roberts, President of the association, said that the people are "beginning to learn that the heaviest tax they pay is not on good roads, but the untold tax they have to pay as the result of old worn-out and inferior roads that can't be traveled more than six months in the year."

Some interesting reports of inspection tours of various highways were read.

A. D. Williams, State Highway Commissioner of West Virginia, presided at the Wednesday morning session, which was held at the Princess Theater. Among the speakers at this session were W. S. Keller, State Highway Engineer of Alabama, who referred particularly to the importance of maintenance in road work; R. T. Brown, of the South Carolina State Highway Commission; C. B. Scott, Assistant State Highway Commissioner of Virginia, on the automobile tax of his state; J. T. Bullen, District Engineer of the U. S. Office of Public Roads and Rural Engineering, on maintenance, and D. H. Winslow, of North Carolina, on gravel, sand, clay and dirt roads.

The afternoon session was presided over by President Henry Roberts, the theme of discussion being state maintained road systems. Government ownership of transcontinental roads was advocated by Col. Joel Fort. Arthur Crownover, Chairman of the Tennessee Highway Commission, said that rapid progress was being made by the state toward the state ownership of highways.

State and federal aid in road construction and maintenance was the principal topic of discussion at the evening session. John Craft, President of the Alabama Good Roads Association, explained the Chamberlain-Dent highway bill; A. G. Batchelder, Executive Chairman of the American Automobile Association, also spoke on the subject.

The convention was shortened one day, closing Thursday instead of Friday as originally planned. Convict labor and the working of interned Germans on southern roads were discussed at the morning session.

On Thursday afternoon, A. D. Williams, in an address, urged the standardization of methods in all road work; D. M. Clark, of the North Carolina legislature, spoke on "Standards for Road Financing."

The building of military roads as provided by the Chamberlain-Dent bill was indorsed by resolution. Other resolutions indorsed, in effect, the following:

1. The creation of a legislative committee within the

association to cooperate with various legislative and executive officials looking toward the enactment of uniform statutes relating to highway location, construction, maintenance and transportation.

2. The preparation by the executive committee in conjunction with the various state highway departments, of a map of the states embraced in the association showing the established highway systems and the improved roads, to be used as a basis for the development and improvement of interstate highways systems.

3. The establishment of a state controlled maintenance system and the application of all automobile license taxes to the maintenance of state and intercounty roads, under the supervision of the respective state departments.

4. The preparation and publication, before the time of the next convention, of a map of the Appalachian Way, as established at the Bluefields meeting in 1915.

5. Uniform state laws with reference to the speed of motor vehicles and traffic ordinances, and a reciprocal relationship between the various states in reference to the use of such vehicles.

6. Condemnation of the use of any advertising signs or emblems tending to confuse drivers of vehicles so as to endanger the public safety, especially the use of the cross-arm danger signal anywhere except at railroad crossings, requesting that state officials take immediate action to correct the abuse of this symbol.

7. The use of federal, state, county and municipal prisoners, including prisoners of war, in the preparation of road and street materials and in the construction and maintenance of roads and streets.

8. The submission of the prohibition amendment to the federal constitution, recently passed by the United States Senate, in view of the reports from the various state highway departments showing a decreased prison population in prohibition territory, tending to reduce crime and thereby benefiting the people.

9. The handling of engineering subjects by engineers, and the establishment of a federal department of highways and transportation, the head of which should be a member of the president's cabinet and a trained engineer of demonstrated ability as an executive, with practical engineering experience covering a period of not less than 10 years' actual service in the class of engineering embraced in the department's control.

10. The careful and continuous inspection of construction work by trained inspectors.

Mr. Williams was elected President of the association for the coming year, and it was decided to hold the next convention at Asheville, N. C. Other officers were elected as follows:

Secretary and Treasurer, Henry H. Jones, Nashville, Tenn. Vice Presidents: Z. D. Dunlap, Nashville, Tenn.; S. G. Hitchens, Baltimore, Md.; Peter L. Atherton, Louisville, Ky.; John Craft, Mobile, Ala.; R. T. Brown, Columbia, S. C.; T. E. Patterson, Atlanta, Ga.; D. M. Clark, Greenville, N. C.; Burdette Woodyard, Parkersburg, W. Va.; J. M. McBeath, Meridian, Miss.; G. R. Ramsey, Orlando, Fla.; A. H. Pettigrew, Bristol, Va. Executive Committee: C. B. Scott, Richmond, Va.; James Maret, Mt. Vernon, Ky.; J. J. Murray, Nashville, Tenn.; F. H. Murray, Columbia, S. C.; W. S. Keller, Montgomery, Ala.; R. D. Kneale, Atlanta, Ga.; H. B. Varner, Lexington, N. C.; W. S. Fallis, Raleigh, N. C.; Henry G. Shirley, Baltimore, Md.; X. A. Kramer, Jackson, Miss.; W. F. Cocke, Tallahassee, Fla.; Henry Roberts, Bristol, Va.; A. G. Batchelder, Washington, D. C.; M. H. Fletcher, Asheville, N. C.

President Roberts reports that the campaign which was launched for state constructed and maintained road systems throughout the South will be kept up until every southern state adopts the plan. He believes that a billion dollar road system would be the best investment the South could make.

PERSONAL NOTES

Lee R. Cooke has been appointed City Engineer of Nampa, Idaho.

H. M. Pafford, City Engineer of Waycross, Ga., has resigned.

F. W. Schreiber, City Engineer of Watertown, S. D., has been made Assistant Highway Engineer of the South Dakota State Highway Commission.

Leslie O. Marden, formerly Office Engineer of the Oklahoma Department of Highways, is now Chief Draftsman of the New Mexico State Highway Commission.

H. K. Rubey, recently Instructor in Civil Engineering at the University of Washington, is now occupying a similar position at the Carnegie Institute of Technology, Pittsburgh, Pa.

Harold D. Hynds, Engineer of the Atlas Portland Cement Co., and Secretary of the American Concrete Institute, has resigned from the former position, and is now connected with the Contract Department of the Turner Construction Co., New York, N. Y.

Almon H. Fuller has resigned as Dean of the Department of Engineering, University of Washington, and is now head of the Department of Civil Engineering, Lafayette College, Allentown, Pa. Prof. Fuller was connected with the University of Washington for about twenty years.

Clifford Older, Bridge Engineer of the Division of Highways of the Illinois Department of Public Works and Buildings, has been appointed Acting Chief Highway Engineer until a successor may be regularly appointed to take the place of William W. Marr, whose death was noted in the issue of Oct. 13.

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The Roads About Camp Merritt, N. J., one of the embarkation camps, will be improved by Bergen County, but the state will repay the cost and look to the federal government for reimbursement.

The Highway Authorities of Adams County, Illinois, have been notified, according to report, that if certain rural post roads in the county were not improved within 60 days, the discontinuance of mail delivery service thereon would be ordered.

The Mayors of a Number of Maryland Municipalities are endeavoring to secure the cooperation of the State Roads Commission in the improvement of roads through incorporated towns. It is said that the demands of the mayors will be embodied in a bill to be introduced at the next session of the Legislature.

Several Large Paving Concerns in Baltimore, Md., are paying their laborers $2.75 a day, an advance of 50 ct., in order to complete their contracts within the time limit. According to report, the work has been delayed on account of the inability of contractors to get an adequate working force. The Baltimore Asphalt Block & Tile Co., the American Paving Co., and P. Flanigan & Sons were the contractors who led the advance in wages.

The Plan of the Government for Improving Forest and Post Roads in California includes two roads in Northern California, one running along the Trinity River, from Weaverville, and the other down the Klamath River, from Happy Camp to Orleans; also a road along the Salmon River, from the forks of the Salmon to the mouth of the river, these being a part of a scheme to make some of the scenery of that part of the state accessible to tourists. In southern California, the construction of a road in San Diego County will serve a number of summer camps in the pine regions of the Laguna Mountains.

LETTER TO THE EDITOR

Federal Aid Rules and Regulations.

Editor, "Good Roads:"

In view of the great interest in and the vast expenditures being made by federal, state, county and city governments throughout the country for improved roads, the action of the Secretary of Agriculture in providing that:

> No portion of the funds appropriated by the federal government to aid the several states in building post roads shall be used either directly or indirectly to pay or to reimburse a state, county or local subdivision for the payment of any royalty or premium on any patented or proprietary material * * * unless purchased or obtained on open actual competitive bidding at the same or a less cost than unpatented articles or methods equally suitable for the same purpose.

should and no doubt will receive careful consideration at the hands of all public officials and everyone really interested in securing for the country the very best roads that can be obtained with the funds available.

The issuance of patents by the government, which is intended to secure to inventors for a limited time the monopoly of the right to make, use and vend their inventions, is a right which every civilized government grants and is intended to promote improvements in the arts and sciences. In view of the great number of patents which have been issued by the government for different kinds of roads and materials, it is evident that the representatives of the government intended that this provision of the law should apply to road building, and it certainly would be a gross injustice for one department of the government to take such action as would nullify the action of another department which granted the patent. It would seem that this is so obvious that it is only necessary to state the proposition without undertaking to argue it more fully.

Whether or not it is a wise policy for the government to issue patents at all or for any purpose is a totally different matter, but so long as the government does authorize the issuance of patents for any purpose, certainly no action should be taken by the administrative departments of the government to ignore, refuse to recognize, or attempt to nullify the action of the legislative department in making the law in accordance with the express provisions of the constitution.

In the management of both individual and corporate business, agents are selected to transact that business for others, and there can be no valid reason why the same rule should not be applied to town, county, state or national representatives in their conduct of public business, unless it be that those representatives are either dishonest or incompetent. Certainly a public official, like the state highway commissioner or engineer, should be chosen to perform the work assigned to him because he is honest, efficient and has special knowledge of the work to be done. If selected for these three qualifications, there can be no good reason for undertaking to hedge him around and hamper the exercise of proper discretion in the conduct of his office with "rules and regulations" as to how he is to perform the work he is selected to do. If we do so hedge him around we thereby acknowledge that the kind of man we are going to select for the work is neither honest, efficient nor competent.

The state highway commission should undoubtedly be given authority to select and locate the road to be improved, adopt plans and specifications for construction, see that the work is actually done in accordance therewith, and determine the kind of road to be built, whether patented or not, price, quality, desirability and all things considered, for which the proposed road is to be built.

This is the way in which all business by private corporations is done when their presidents and other officers are selected, and the funds to be expended by our public officials are small when compared to the funds handled by private corporations.

The result actually accomplished is undoubtedly the standard by which private officials are judged, and the same rule should be applied to public officials when they are permitted to exercise that discretion which would enable them to produce results and where "rules and regulations" have not been adopted which necessarily imply that they are either dishonest or incompetent. In fact, the adoption of stringent "rules and regulations" renders it impossible for the public to receive the benefit of the services of the honest, efficient and most competent men in the community for performing a public service, for the reason that no thoroughly honest, efficient and competent man will undertake a public work when he knows in advance that he is surrounded by unreasonable "rules and regulations," which have been imposed upon him. The kind of highway commissioner that presumably every state in the Union will select is a man who does not need to be told how he is to do the work assigned to him. That is what he is selected for, and if he is honest and competent he should have a free hand to spend the funds which the state and federal governments appropriate for that purpose and to spend them exactly as he may deem best and most appropriate for the general good. Give freedom of action and impose responsibility upon the official selected, and you will no doubt secure a real man as a highway commissioner, not a several headed commission, not a mere dummy, or someone who can be purchased, but a man who will perform a real service in the interest of the people of the whole state. Not until the service of such a man is secured will any state in the Union have a system of good roads everywhere as the public is entitled to. Such an official certainly should be permitted to use such patented or unpatented article as he may find from experience best adapted and, all things considered, most economical for the locality and the purpose for which it is to be used.

It is a well established fact that "rules and regulations" never have succeeded in making an immoral man moral, a dishonest man honest, or an incompetent man competent to perform the service for which he is chosen.

CHARLES HENRY DAVIS, C. E.
President, National Highways Association.
Cambridge, Mass.

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The Prison Road Camp at Mineola, Montgomery County, Mo., is conducted on the honor plan—there are no guards and the men do not wear striped clothing. The quarters are sanitary and attractive, and the men are given plenty of well-cooked, wholesome food. They put in 8 hours a day, and so far have made an excellent showing on a difficult piece of road construction, according to advices from the Missouri State Highway Department. This is the first try-out of prison labor on the roads under the new state law, and it is working so successfully that other counties of the state are becoming interested in this plan for securing road improvement. The law provides that state prisoners may not be employed on contract work, but may be furnished to counties doing work by day labor, the price of prison labor being fixed by the Governor at $1.25 per day, at present. Application for prison labor is made through the county courts to the State Highway Department and the State Prison Board. The advantages of prison labor are that it not only meets the general scarcity of labor for road building at this time, but a well organized force soon becomes skilled in the operation of machinery, and the work may proceed with the assurance that labor at a fixed price will be available for its completion.

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Experiment on Sand Roads by the Wisconsin Highway Commission

By H. J. KUELLING.*

Under the new state trunk highway law of Wisconsin the Wisconsin Highway Commission found itself with the problem of looking after the maintenance of about 700 mi. of almost pure sand roads. These roads were of such a nature that many of them were impassable in dry weather and often in wet weather owing to the sand becoming quick. In other words, these roads were in bad condition a considerable share of the summer season and part of the spring season.

In times past many of the local communities had placed a covering of clay on these roads where any clay was available. Still other communities had placed some straw or hay on the traveled section, but this was always quite temporary, as the hay was soon ground to pieces or rotted away.

FIRST COURSE OF HAY AND SAND AND SECOND COURSE OF HAY IN PLACE READY FOR THE APPLICATION OF TAR.

State Highway Engineer A. R. Hirst conceived the idea of making a mat of hay and tar, which would have some strength within itself and also be able to withstand the elements. With this end in view the State Highway Department constructed a few short sections, built in various manners, in the month of August, 1917. After about six weeks' wear the condition of some of these sections was satisfactory enough to warrant the construction of a longer experimental section. This latter piece was built during the first week of October and is somewhat over a mile in length.

No particular merits are claimed as yet for this type of construction, but it will be watched with a great deal of interest by the engineers of the department and the various local people who live in the sand sections of the state.

The experimental road was constructed about as follows: The road was first staked out as to alignment. A furrow was then plowed on each side of the road in order to hold the grader somewhat true to line. Needless to say, one team was able to accomplish this act. After the plowing was done two teams were hitched to a small road grader, and after several trips up and down the road a reasonably good trench was constructed.

FIRST COURSE OF RYE STRAW SPREAD AND TAR APPLIED; READY FOR THE SPREADING OF A COURSE OF HAY.

The road had previously been divided into twelve sections, which were constructed as follows:

Section No. 1.—This section is 1,000 ft. long and 16 ft. in width. It is one of two sections that contain an appreciable grade at one point about 200 ft. of 8%. This particular hill has been a bugaboo for tourists for several years, and especially during the past season because of the fact that this road is the main road from Portage to Kilbourn and thence on to Camp Douglas, where the Wisconsin troops have been in camp. This section was covered with a layer of marsh hay, after which it was given about a ½-gal. treatment of tarvia "B," applied cold. A second layer of hay was then applied and slightly over a ½-gal. treatment was given. The section on the steep hill was given a considerably larger treatment of tar than the flatter sections. After the last application of tar, sand from the roadside was spread by shovels over the entire section to a depth of about 1 in. The hay used on the section, as well as on each one of the other sections was spread so that a ton covered about 350 sq. yd.

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*Assistant to the State Highway Engineer, Madison, Wis.

Section No. 2.—This section is 1,000 ft. long and 9 ft. in width. After the trench was constructed a layer of hay was placed and given about a ½-gal. treatment of tarvia. This layer of hay contained about one-half the hay that was applied on the section. One-half of the remaining amount of hay was added and given a ¼-gal. treatment of tar. The remainder of the hay was then added in a third layer and this also given a ¼-gal. treatment of tar. The section was then covered with about 1 in. of sand from the roadside.

Section No. 3.—This section is 200 ft. long and 9 ft. wide. It was made short because of the fact that it was almost impossible to obtain rye straw, as the farmers did not care to sell it. The straw was placed on this section in the same manner as hay had been placed on the previous section, and in the same quantity as to volume but, of course, not as to weight, a ton of straw going much farther than a ton of hay. The straw was divided into two layers, each one receiving a ½-gal. treatment of tar. The whole section was then covered with about 1 in. of sand from the roadside.

Section No. 4.—This section is 1,000 ft. long and 9 ft. wide. The first layer of marsh hay was placed and, without having received any treatment of tar, was covered with about 1 in. of sand from the roadside. The remainder of the hay was then added and given a ½-gal. treatment of tar. This was followed with about 1 in. of sand from the roadside. The subgrade conditions on this section varied considerably, as the central part of the section had a harder subsoil than most of the road. The two ends, however, were exceedingly soft sand. This section appeared to be somewhat easier to construct than the other tarred sections because the heavy oiler did not rut the subgrade so deeply.

Section No. 5.—This section is 500 ft. long and 9 ft. wide. It was covered with two layers of hay, each of which was given a ¼-gal. treatment of tar. The second layer of hay on this section was extra heavy and caused considerable trouble by getting into the gears on the oiler. This section was also covered with about 1 in. of sand from the roadside.

Section No. 6.—This section is 500 ft. long and 9 ft. wide. The entire amount of hay was put on at once and given a ¾-gal. treatment of tar, after which the section was covered with about 1 in. of sand from the roadside.

These six sections were the only ones in which the tar and hay were used together. Considerable trouble was had at first in getting the tar properly applied owing to the fact that the weather was fairly cool. To overcome this the tank car was heated, after which the sprayers on the oiler worked very satisfactorily, giving an almost uniform coating of ¼-gal. per sq. yd.

Section No. 7.—This section is 500 ft. long and 9 ft. wide. A layer of marsh hay was placed and covered with about 1 in. of local sand. The remainder of the hay was put on and also covered with about 1 in. of local sand, after which the road was thrown open to traffic.

Section No. 8.—This section is 150 ft. long and 9 ft. wide. A layer of rye straw was placed and covered with about 1 in. of sand. This straw was in poor condition because of the fact that it was from the 1916 crop. A second layer of the same kind and amount of straw was placed and also covered with about 1 in. of local sand.

Section No. 9.—This section is 100 ft. long and 9 ft. wide. The full computed amount of straw was placed in one layer and covered with about 1 in. of sand from the roadside.

Section No. 10.—This section is 550 ft. long and 9 ft. wide. The full computed amount of hay was placed in one layer and covered with about 1 in. of local sand.

Section No. 11.—This section is about 300 ft. long and 10 ft. wide. Owing to the fact that a great many local people believed that tar alone would be beneficial, about 1 gal. of tar was placed directly upon the roadbed. No particular good is expected to result from this and it was constructed somewhat to show what not to do.

Section No. 12.—This section consists of two pieces about 300 ft. long. On this section no trench was made and the hay was merely deposited on top of the sandy road, as had been done by the local people for several years. These sections were not given any treatment of sand from the roadside.

The cost of the hay and straw for the experiment consisted of an expenditure of $7.00 for rye straw purchased at $6 per ton, and $156 for marsh hay purchased at $8 per ton, delivered on the road. The cost of labor and teams was $216, and the cost of the tar $322, making a total of $701 for the construction of 4,977 sq. yd. which were treated with tarvia at a rate or from ½-gal. to somewhat over 1 gal. per sq. yd., and the 1,900 sq. yd. which did not receive any tarvia treatment.

It is not expected by the State Highway Commission that all of the sections will be an economic success. However, if a method is arrived at by which these sand roads can be made passable at reasonable cost, the commission will be satisfied. If the section that is now two months old, built in a similar manner, is any criterion, traffic will be well pleased with this type of road. On the section in question there is a very well compacted mat which is carrying the traffic in a very satisfactory manner.

As stated by the writer, this experiment will be watched with a great deal of interest, and at some future date the commission will be glad to publish a description of the condition of the road and what it believes concerning it.

APPLYING TAR ON FIRST COURSE OF HAY—WISCONSIN EXPERIMENTS WITH HAY AND STRAW ON SANDY ROADS.

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For Blocking the Drainage of Roads at the entrance to farms, a penalty of $5 to $25 is provided by the highway law of Indiana.

Williamson County, Texas, has been granted $50,000 of federal aid money for constructing the Meridian Road. Application was made to the State Highway Commission by the county judge and a delegation of citizens of Georgetown and Taylor.

Considerations Governing the Choice of the Various Types of Road Construction*

By L. V. EDWARDS†

The failures, during the past few years, of many different types of road surfaces, that were thought—at least by those who authorized their construction—to be practically permanent has aroused alike the road official and the taxpayer. On account of such failures, many charges are being made of dishonest work on the part of the contractor and incorrect specifications and inefficient supervision on the part of the engineering forces. There may be some truth in these accusations, but it is my opinion that at least as many failures have resulted on account of poor judgment being used in selecting the type of surface as in dishonest construction and inefficient supervision. In other words, as much money is being wasted by those officials who are responsible for the type of road constructed as there is by those charged with the construction.

To illustrate this point: Suppose a road should be constructed of nice fresh eggs. Suppose that the specifications required that each egg be tested to insure the proper quality and that they should be hand placed, on a properly constructed foundation, to the desired crown and grade. Also suppose that in the construction the specifications were enforced to the very letter, and that everything was done that was necessary to make a nice, smooth, well constructed highway. Then suppose the finished road were thrown open to traffic and the first vehicle to pass over it was a 12-ton truck traveling at a speed of 15 to 20 mi. per hour. It is quite evident that there would be some "signs" of failure; and what is more, no one would be surprised at the result. The failure in this case would not be due to poor construction, but to poor judgment in selecting a type of surface that was not strong enough to carry the traffic. This illustration sounds ridiculous, but its equivalent is being done every day. We continue to place thin crushed rock and water bound surfaces on roads that have from 200 to 600 motor vehicles per day when it is a known fact that such surfaces will not stand a motor traffic of more than 50 to 100 vehicles per day, regardless of the care used in their construction. Yet when these surfaces fail we express surprise and indignation and accuse somebody of being incompetent or crooked. The fact of the matter is that these roads are not strong enough to carry the traffic put upon them.

Snap Judgment

Before taking up a discussion of some of the points that should be considered when selecting a type of road it might be well to mention a few of the things that are sometimes done that do not aid sound reasoning when trying to decide upon the proper method to follow. As far as I know, road building is the only kind of business in which great weight is given to snap judgment. Many highway boards, apparently without question, act upon recommendations passed by some chamber of commerce or farmers' organization when probably the only thing considered was the item of first cost. It is an unfortunate fact that there are so many men, particularly among automobile drivers, who think they are qualified to decide offhand the kind of treatment that should be given to any class of road. As a result of this supposed knowledge by so many there is much free advice given, and damage is done by not recognizing the fact that in the majority of cases the advice is worth no more than it cost to get it.

Very often a type of construction involving the expenditure of thousands of dollars is selected upon the recommendation of some person who is interested in a patented pavement, or of some one who is interested in selling a certain kind of material, or by the board having the power of selection mistaking its lack of knowledge of the existing conditions and types of surfaces for great wisdom. I do not know of a better way for snap judgment to be formed by a committee of inexperienced men than for them to go on a two or three days' tour of inspection of the streets and roads in and around a big city, under the guidance of a skilled person who is interested in promoting some particular type of surface.

The average person is inclined to be hasty in his opinion, and is often unduly influenced by his impressions. If he has recently been taken over a considerable mileage of one type of surface that is in fine condition, and is then driven over another kind that is in a bad state of repair he is, upon this evidence alone, likely to become strongly prejudiced against the one and favorable towards the other.

I remember having talked with a gentleman who had recently returned from an inspection trip of the kind mentioned. He had formed a very high opinion of a certain type of construction and a very poor opinion of one of the best known types When I tried to explain to him that the type of construction he was so enthusiastic over had not been in use more than ten years, and that it was proving to be unsatisfactory in a number of places where it had been laid, and that the pavement he was condemning so severely had withstood the traffic of Fifth Avenue, New York City, which had a probable daily traffic of 14,000 vehicles, for a period of 17 years, and that there were several cities where it had been in service over a period of 25 years, he concluded that I was prejudiced and was greatly exaggerating the truth, for had he not seen the condition of the two types of pavement with his own eyes?

There is no question but that a great deal can be learned in a short time by making an inspection trip over several different types of pavement, and the cost of making such an inspection may be an infinitesimal amount compared with the saving resulting from the knowledge gained. But one must be very careful or false impressions will be made. For this reason, I believe that these trips should be made at the expense of the political subdivision represented and always in company with an experienced engineer.

Factors Controlling the Selection of Type

When any highway improvement is undertaken the object to be sought is to select the type of construction that will serve the traffic to be carried at the lowest annual cost per unit. To thoroughly understand that statement, it must be kept in mind that the three main items in the total cost of a road surface are first cost, maintenance cost, and interest on the money invested. These are all variables, and, with the exception of the interest rate, depend entirely upon local conditions. The problem, therefore, resolves itself into a study of local conditions, which, with a knowledge of the characteristics and the traffic resisting qualities of the several kinds of surface, makes it possible to select that type of construction which, at least approximately, will serve the traffic at a minimum cost.

When considering the type of road to be built there is no question but that in many cases too much weight is given to the first cost of construction and not enough to maintenance cost and other considerations. The tendency has been to select the cheapest road, with the hope that maybe it would prove to be the best. The great demand for as much mileage of improved highway as it is possible to get with the amount of money available, even though it may be second rate, has undoubtedly had much to do with the selection of unsuitable surfaces. Many, however, are now beginning to realize that it is the poorest sort of economy to spend in constructing a surface that immediately fails, thus requiring excessive maintenance work if the highway is to be kept in passable condition, two-thirds as much money as would be required to construct a different kind that would have sufficient strength and durability to carry the traffic with only a small annual cost for maintenance.

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*Paper presented at the joint session of the annual conventions of the Washington State Association of County Commissioners and the Washington State Association of County Engineers, Spokane, Wash., Sept. 6-8, 1917.

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As has just been pointed out, for economical results, maintenance, interest and the volume of traffic must be considered. It is evident, therefore, that there is no type of construction that will give economical results under all conditions. A type of road costing $15,000 per mi. may be more economical in one case, whille in another case traffic might be so light that $1,000 per mi. would be the proper amount to expend. If all the different roads in a county were surfaced with the proper type, in each case, to give the least annual cost per unit of traffic, there would necessarily have to be many different kinds in use to satisfy the variable conditions. There would probably have to be a large mileage of earth, gravel and macadam, as well as of the more durable types such as bituminous concrete and brick. A point to be noted is that with such a system the annual cost per unit of traffic would be the same on the earth or gravel as it would be on the bituminous concrete or brick.

It has already been intimated that local conditions are the important things that must be studied before it is possible to decide upon the correct type of construction in any given case. A study must be made of the climatic conditions; the effect of moisture and frost action on the subgrade, in other words, drainage; the quality and availability of road building materials; the kind and amount of traffic, etc. These not only have a bearing on the first cost and, therefore, the selection of the proper type, but also affect or control the design of the type that is to be used.

At this point I wish to digress somewhat to emphasize the importance of a thorough knowledge of subgrade conditions when designing a surface for a given road. Highway engineers probably commit more sins on account of insufficient knowledge on this one point than on any other part of the work. One of the things that must be studied to obtain a proper knowledge of the conditions is the nature of the soil in the subgrade from one end of the improvement to the other. This would probably involve a determination of the approximate amount of mineral matter present and the effect that water and frost would have on the material. The designer must also know the topography of the locality and the laws governing the flow of both surface and underground water to be able to know what effect these will have on the finished roadway. He must also know the supporting power of the subgrade, at least at the points where it is weakest, in order to design a surface that will be sufficiently strong to carry the road over these places. The supporting power of any subgrade, no matter what care has been taken in its preparation, is a very variable quantity. It is, therefore, not to be wondered at that when miles of pavement, having a uniform thickness, which means also uniform strength, are placed on this unequal support parts of the pavement fail while other parts remain good. Think of the money that could be saved if engineers knew enough to vary the thickness of the surface during construction, within the proper limits, to take advantage of this unequal supporting power.

Traffic

As has already been said, traffic is one of the main factors that must be considered in the selection of a type of surface. The importance of the need of knowing at least the approximate amount of traffic that our highways are carrying cannot be overestimated. It does not seem reasonable that one would undertake to build a structure to perform a certain service when he knew nothing, or practically nothing, about the nature of the service to be performed. This, however, is being done every day in highway work. Owing to the large number of variables that influence the volume of traffic that any highway may have, a considerable amount of investigation has to be made before it is possible to make a reliable estimate of the daily or annual traffic that any road may have during its life. Fortunately, however, to serve a good purpose in determining the type of road to construct, it is not necessary to have an exact knowledge of the traffic to be served. If the traffic were estimated within 50% of the correct amount it would be a great deal better than knowing nothing about it at all, as is so often the case at the present time.

The best way, of course, to find out the traffic any road is carrying is to make a count, or take a traffic census. To get absolutely correct results would require that a count be made every day in the year, but sufficiently reliable results can be obtained if the count is taken for 10 to 14 hours every third, fifth or thirteenth day throughout the year, or at less frequent intervals if the importance of the road does not justify the more careful count. A splendid idea of the relative importance of the several roads in a county can be had by taking even one count extended over a period of two or three days simultaneously on all the roads. Even a very little traffic data, if studied in connection with other things, will often make it possible to predict, with a reasonable degree of accuracy, what the traffic will be, and give a good idea of the rate of increase. Some of the things to be considered which affect the volume of traffic are: Population; assessed valuation of the property; the nature of the agricultural work; the number of automobiles and other vehicles in use; and whether or not the road is a section of a trunk line highway. The probable rate of increase in traffic must also be considered. For example, the volume of traffic on a given road does not increase directly as the tributary population increases, but as the square of the increase in population, other things being equal. This means that when the population doubles, the traffic on the highway will be quadrupled.

Sometimes the traffic on a highway increases several hundred per cent. immediately after it has been improved. This is to be expected if the tributary and parallel roads are in poor condition. The traffic on the first road will tend to decrease when these tributary roads are improved.

If time permitted, a great deal could be said about methods of taking traffic census and how the variations in the volume of traffic on a given highway would affect the maintenance cost of different types of surfaces.

When making comparisons of two different types of surfaces for the same highway, several things must be considered besides the first cost and annual maintenance cost. Suppose, for example, that a bituminous concrete surface is being compared with a water bound macadam surface (assuming, of course, that it would be possible to maintain a macadam surface where the traffic was heavy enough to justify a bituminous concrete surface). Even though the unit cost of traffic might figure the same for the two types, the superior degree of service furnished by the bituminous concrete would be a point in its favor. Also, the less rolling resistance to traffic, less damage to vehicles, particularly the tires of automobile, and its appearance would all be points in favor of the more costly type, while the water bound macadam would have the advantage from the standpoint of better foothold for horses. Another thing must be considered when making the comparison between the two, and that is the value of the pavement when it has reached the stage where it is necessary to reconstruct the surface. This residual value, as it may be called, may be as much as 75% of the original cost in one case, while in the other it may be practically zero. To illustrate: Suppose a bituminous concrete surface were originally constructed of 3 in. of bituminous concrete on a 7-in. Portland cement concrete foundation. At the end of 20 years, say, the bituminous portions of the pavement may have to be reconstructed in which case it probably would be necessary only to clean the bituminous surface, rip it from the concrete foundation, reheat it, adding enough bituminous cement and mineral aggregate to give it the proper quality and enough volume to allow for the loss in wear and replace on the old concrete foundation. The pavement would then be good for another 20 years. It is evident that the cost of this second construction would amount to only a small part of the first cost.

Recapitulation

For a proper selection of the type of road surface the following things must be known to at least a fair degree of accuracy:

(1) Local conditions as they affect the design and first cost.

(2) The amount of traffic to be accommodated by the highway.

(3) The characteristics, such as appearance, ease of traction, foothold for horses, ease of making repairs and cleaning, durability (meaning the power to resist the action of the elements) and the traffic resisting quality of the various types of road surfaces.

Experienced highway engineers who know the life history of the various types of construction and their behavior under different climatic and traffic conditions are able to predict with a reasonable degree of accuracy the behavior of any type of construction when subjected to a known set of conditions. It is the adjusting of the knowledge of the different types to the local conditions such that traffic will be served at the lowest unit annual cost that solves the problem. This problem is essentially an engineering one, and is worthy of the most conscientious efforts of the best trained engineers. To emphasize this point I wish to quote in closing this paper from an article by Mr. Rodman Wiley, State Highway Commissioner of Kentucky.

"The day will come," he says, "and it should not be far distant, when the taxpayers will appreciate the fact that the roads are their property, that the same care should be given to the expenditures of such funds as is given to the management of their own private affairs. When they are ill, they consult a doctor; any legal problems are intrusted to a lawyer, and for the salvation of their souls they usually accept the advice and recommendations of a minister of the gospel. When they employ labor, it is their aim to secure a man who is familiar with the work he is supposed to perform, and yet when it comes to road affairs they eagerly listen to any demagogue who has pet theories concerning road building, forgetting that there are accepted standards for road work the same as for building railroads, steam engines, or office buildings. * * *

"When the people realize that the building of roads, and especially the selection of the type of road, is a high class engineering problem and that such matters should be intrusted to high class highway engineers, amply paid, the same as men in other professions, then and only then will the taxpayers be properly safeguarded and will we experience a wise and economical expenditure of road funds."

Public Improvements During War Time[*]

By JAMES L. BEGGS[†]

One of the most important problems confronting cities at this time is a decision as to what course to pursue in continuing public improvements during the war. There are strong advocates both for continuing and discontinuing such improvements. Personally, I believe it would be a national calamity to cease public improvements and throw hundreds of thousands of workmen out of employment. But an idea growing popular is to cease any business not assisting the direct prosecution of the war, for the reason that such work deprives the country of the necessary men, funds and material. On the surface, this argument rings with patriotism, but look sanely below the surface of the situation of closed business activities and tell me where the people are to get this money to subscribe to the war reliefs and to purchase the Liberty Bonds. How are the unemployed to be even self-sustaining?

The continuance of public improvements during the war is also being criticised, arguing that the country needs the men, money and material. The argument in favor of the continuance of usual business activities holds fast in favor of public improvements being continued wherever possible.

If the material used and the class of labor employed were needed by the government, were the taxes appropriated for the payment for such work transferable to the War Department, the Red Cross, the Navy League or the Allies, then I would agree that it would be retarding the war to continue through this crisis the usual public improvement.

The government has control of the materials necessary to the preparation and prosecution of the war. Cement, rock, gravel, sand, tile, brick and asphalt, the materials mostly employed in the development of public work, are not thus controlled but could be when necessary. The man who makes ready these materials is not skilled in any other line of work and if he were and of draft age, could be utilized by the War Department at any time. Neither is the laborer employed in the development of public work skilled in other work and he could not be turned to use in the direct activities. But to keep this man employed at his usual occupation as in normal times, enables him to feed, clothe and care for his family. In short, it keeps the money in circulation. A portion of it goes to the grocer and to the shoe and dry goods merchant. The business man has more funds with which to buy Liberty Bonds and to subscribe to the war reliefs.

The laborer thus provided with work is in an independent position, able to care for his family and giving the country a wiser form of economy than having a line of women and children applying to the city and county for aid. Taxes are required to feed the needy. Then why not take the taxes to make improvements whereby an honest laborer willing to work may acquire the funds for a livelihood and not be humbled to beg?

Why demoralize our citizenship at a time when the country is demanding the efforts of our best men? I believe that during this war all are demanding the efforts of our best men. I believe that during this war all public and private work should be carried on at as nearly a normal level as possible. And if the time comes when the government shall call upon these laborers for army duty in the fight for the democracy of the world the response will be made by strong, patriotic citizens and not by charity seekers made weaklings by a false economy program.

Cease public improvement in my city and my own laborers and those of many of the contractors would be needing aid in a very short space of time. Let this class of work cease over the entire country and the laborer go unemployed and you can readily see the result.

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[*] Paper presented at the ninth annual convention of the League of Kansas Municipalities, Wichita, Kan., Oct. 16-18, 1917.

[†] Commissioner of Streets and Public Improvements, Kansas City, Kan.

The man at the quarry, at the cement plant and the various other industries where materials used in this class of work are prepared would be in large numbers not needed and would go to swell the number of unemployed.

There is a strong argument against the levy of special assessments. This money, in the opinion of many, should be used for the prosecution of the war, but the advocates of such a plan have never presented any means of diverting such funds directly for war purposes.

In my opinion, there are those who will not respond to the war calls but who will hoard and save for personal gain, and the levy of special taxes is one way in which such money could be kept in circulation. The circulation of money is an all important question in any nation during peace, and during war it is a patriotic duty.

Take this direct side of the question. An invaluable service could be rendered our country if each city, county and state would build new roads and improve and conserve those already built, that there might exist broad smooth highways to the seaports and the many cantonments whereon motor trucks might be used to convey material from farm, factory and foundry to its destination. There is already mention of the railroads being worked to their limit and I read that our factories can turn out trucks at the rate of several hundred per day. With good roads ready—for it takes longer to build a road than a motor truck—we would be of direct service in the war and we also would have kept employed the man unfitted to take up other lines of work, not of the age to shoulder a gun and fight in the trenches but equally valuable to his country in the pursuit of his usual occupation.

The country has been asked to cease its wastefulness and our president said in addition to this appeal: "It is evident to every thinking man that our industries must be made more prolific."

To let a street, highway, alley, sewer, sidewalk, bridge or public utility go unrepaired is wastefulness. It may be called economy by some, but is not such economy penny wise and pound foolish?

To keep in as normal condition as possible during this war, industries, public improvements and utilities, is efficiency, economy and conservation and is definitely our part in this world conflict.

Of course, we are facing a condition that cities have never faced before. Material and labor costs have advanced with such rapidity in the last few months that there must necessarily be a smaller yardage of improvement work unless taxes are increased or unless city officials devote their energies to working out a plan to keep up to the normal amount.

Report of the British Road Board

The seventh annual report of the Road Board, issued in compliance with the provisions of the Development and Road Improvement Funds Act, shows that during the year ending March 31, 1917, applications for advances amounted in the United Kingdom to £1,051,905, of which 91.88% was for the improvement of road crusts. This was an increase of £741,644 as compared with 1915-16, and a decrease of £949,359 over 1914-15.

The receipts credited to the Road Improvement Fund were for interest and profits on investments and loans, amounting to £152,902. The decrease of £655,501 over the previous year was due to the absence of motor spirit duties and carriage licenses in 1917; in 1916 the receipts from these sources were £461,356 and £233,039, respectively. Proceeds from these accounts, formerly paid to the board, are now retained in the Exchequer as provided by the Finance Act of 1915.

The net disbursements on account of administrative expenses, grants, and loans amounted for the year ending March 31, 1917, to £254,568, a reduction of £174,807 over the previous year.

The grants and loans, amounting to £301,322, were made chiefly for the improvement of road crusts. New roads and bridges received but £2,035, while but £1,412 was spent on road widenings and improvements of curves, gradients and corners.

The report contains a table showing the annual growth of expenditures on maintenance, improvement and cleaning of roads and bridges, from 1910-11 to 1914-15. For the year ending March 31, 1915, the expenditure in England and Wales was £13,290,426, as compared with £13,201,386 in the previous year, the figures for Scotland and Ireland showing no substantial change. The table also shows the expenditure per head of population and per pound of assessable value.

It is stated that since the outbreak of the war great advantage has been derived from the improvement of important roads with the aid of grants and loans from the road improvement fund, but that great damage has resulted from heavy motor traffic, directly or indirectly connected with military movements and the transportation of war supplies. Notwithstanding the expenditure of upward of £1,500,000 on special road work from army funds and government contributions, the condition of an extensive road mileage has greatly deteriorated.

The substitution of motor vehicle for horse-drawn traffic in agricultural sections has also resulted in damage to a number of highways, according to the report. For financial reasons and owing to the shortage of labor and materials, it was found necessary to curtail maintenance expenditures, and a large amount of work will be required to restore the roads to the condition they were in before the war.

The views of the board with respect to the question of expenditure for road improvement, apart from maintenance and special damage caused by unusual conditions, are contained in a letter to the Secretary of the Reconstruction Committee, dated Jan. 17, 1917.

In this communication, the work is divided into four classes, (1) strengthening and resurfacing, drainage reconstruction and resurfacing, (2) widening and new construction approved but not executed owing to war conditions, (3) reconstruction of bridges on important roads that are unable to support heavy motor traffic, and (4) schemes for the construction of new roads and bridges, widenings in urban areas involving the purchase of buildings, and improvement of important country roads also involving the purchase of property.

The views of the board concerning the first class of work are set forth in the following:

> The most urgent need at the present time is the reconstruction of important roads which are too weak to carry modern traffic. The urgency of this reconstruction is two-fold: (1) to provide for the traffic of heavy motor vehicles which is expected to expand rapidly after the conclusion of the war, and, if not provided for in advance, will cause serious deterioration of roads and consequential damage and expenditure; and (2) experience has shown that it is less costly to highway authorities, in the long run, to construct roads of a type suitable for the traffic, rather than to continue the use of methods and materials which have become antiquated.

(*Continued on page 236*)

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

NOVEMBER 3, 1917

AN ANNOUNCEMENT

"The Highway Contractor and Road Builder," for the past several years published monthly at Albany, N. Y., has been purchased by The E. L. Powers Co. and will be merged with "Good Roads," the first issue of the combined publications appearing Nov. 10.

The publication which has been taken over is, as its name implies, a journal especially devoted to matters of interest to road contractors. It has been published by the New York State Road Builders' Association, an organization of contractors doing road work in New York State and vicinity, and has been the official bulletin of that organization, the Connecticut General Contractors' Association, the Massachusetts Highway Association and the New Hampshire Good Roads Association. As an integral part of "Good Roads," it will continue in that capacity.

The future plan of publication provides for one issue of "Good Roads" each month in which will be included the news of the several associations already mentioned, which has previously been printed in "The Highway Contractor and Road Builder." This number will appear on the second Saturday of each month and will be offered to those who wish only that issue, at a special subscription price.

No change will be made in the policies of "Good Roads," nor in the character of the matter presented, except for the publication of this special news matter in one issue a month. Readers of "Good Roads" will, therefore, miss none of the features to which they have been accustomed. Former readers of "The Highway Contractor and Road Builder" will at the same time obtain the news that heretofore they have found in that paper.

The subscription and advertising contracts of "The Highway Contractor and Road Builder" will, of course, be carried out by "Good Roads."

"Good Roads" takes this opportunity to thank its readers and advertisers for their support in the past and to bespeak the continuation of that support in the future. The efforts that have made "Good Roads" a leader in the field of road and street construction and maintenance will be continued, and it is the hope and belief of the editors that under the new arrangement these can be made even more fruitful than in the past.

INTERESTING EXPERIMENTAL WORK IN WISCONSIN

Sandy roads are of more or less common occurence throughout the country, and have long been sources of trouble to those in charge of road improvement. For these reasons, peculiar interest attaches to the experimental work recently carried out by the Wisconsin Highway Commission and described by H. J. Kuelling, elsewhere in this issue.

According to present information, the treatment employed was new; certainly it was unusual. At the same time it involved the use of no materials that are not generally available and no methods that cannot readily be followed.

The cost, also, was low. According to Mr. Kuelling's data, the average was about 10.2 ct. per sq. yd. or approximately $925 per mi. of 16-ft. road.

The work is still too recent to permit of any conclusions as to its results, but subsequent reports from those in charge should prove most interesting.

AN ILL CONSIDERED WAR MEASURE.

"Good Roads" is firm in the belief that the first business of America is the winning of the war. It readily and gladly accedes to the theory that everything else should be subordinated to this end, even to the curtailment of industries that hinder the successful prosecution of the war through their use of labor and materials needed for that purpose.

It cannot, however, either support or fail to protest against any policy or action, official or otherwise, tending to retard the very necessary work of road and street construction and maintenance. For that reason, it is felt that a recent order affecting the transportation of road material is an ill considered move which, in the end, will react to the disadvantage of this country.

The order referred to has recently been issued from the War Industries Board, and is intended to relieve the car shortage that has seriously interfered with the transportation of materials necessary for the conduct of the war and for the sustenance of the military forces and the civil population. It forbids the use of open top freight cars on and after Nov. 1, for the transportation of materials and supplies, except coal, "for the construction, maintenance or repair of public or private highways, roadways, streets or sidewalks." It also prohibits the use of such cars to transport materials or supplies, other than coal, "for the construction, maintenance, or repair of theaters or other buildings or structures to be used for amusement purposes" and "for the manufacture of pleasure and passenger vehicles, furniture or musical instruments."

There can be no question of the good intentions of the authorities in making this order. The car shortage has become more than serious, and there is every reason to confine the use of available cars to the most necessary work, and for using them in the most efficient manner possible. For that reason, it is entirely justifiable to forbid the use of cars for the transportation of materials used in the manufacture of luxuries, or for the transportation of manufactured products coming under this classification. Roads and streets, however, are not luxuries. They are necessities, and as has been pointed out a number of times within the past few months in these columns, they are particularly necessary now. At the present stage of the war this country's task is divided into two great parts. One consists of the military operations in Europe. The other —fully as important, though non-military in character—

comprises the work that must be done in this country. This latter includes not only the production and transportation of supplies of all kinds for the troops, but also the maintenance of the country's industrial and commercial life which, if discontinued, would shut off the funds without which no war can be prosecuted. In all of the work in this country, roads play a most important part. They are necessary to the ordinary industries of peace and the extraordinary undertakings incident to war and are of special importance in the feeding of the civil populations and the military establishments of the United States and the Allies.

The food problem is quite as much a matter of distribution as of production, and if, as has so frequently been stated, the food produced and distributed by America is to decide the present conflict, there is certainly every reason for doing all that is possible to provide better transportation facilities. Food must be carried by railroads or by motor trucks. Trucks cannot be operated unless there are roads nor can railroads obtain freight without roads for feeders. Road building must go on, not only to take care of present needs, but to prepare for future contingencies.

Report of the British Road Board

(Continued From Page 234.)

The total mileage of roads in England and Wales is 152,000. It may be assumed that 10% of the total, or about 15,000 mi., stand in need, more or less urgent, of reconstruction or strengthening, as distinguished from resurfacing in the course of ordinary maintenance, in order to enable the roads to carry the growing motor traffic. The cost of reconstruction may be estimated at from £1,000 to £4,000 per mi., or at an average of £2,000 per mi. The total cost of dealing with 15,000 mi. may be estimated, therefore, at approximately £30,000,000 over and above the normal expenditure of the local authorities on current and deferred maintenance.

The annual expenditure of highway authorities in England and Wales on maintenance and improvemets, including loan charges, is about £16,000,000. This sum is provided out of the local rates, with some assistance from the Exchequer Contribution account. For practical purposes £16,000,000 may be regarded as the maximum which highway authorities will spend on road services under existing conditions. There is no practical prospect of these authorities providing, without express statutory direction or considerable financial assistance from central funds, the capital sum which is necessary to reconstruct the more important roads of the country, even though the expenditure of that capital could be shown, not only to effect large savings in the wear and tear of vehicles, but also to arrest the increase in annual maintenance expenditure, which has been growing at a very serious rate and which is certain, unless large capital expenditure is incurred, to continue to grow, if deterioration of roads is to be prevented.

Apart from the local rates and Imperial Subventions, the only public revenue available for road purposes is the Road Improvement Fund. The income of this fund, for the financial year ended March 31, 1915, was £1,621,000. Of this sum, £898,000 was the proceeds of the motor spirit duties, £630,500 arose from carriage licenses, and £92,500 from interest on investments. The revenue from the motor spirit duties and carriage licenses has since August, 1916, been diverted from the Road Improvement Fund to the Exchequer. The proceeds of the motor spirit duties were the result of a tax of 3d. per gal. on petrol used in private cars and 1½d. per gal. on petrol used in commercial and public service vehicles. Since that date, the duties and license charges on petrol used in private cars have been increased to 1s. per gal. and in commercial and public service vehicles to 3d. per gal. The proceeds of these increased duties are not known to the Road Board.

The restoration of the proceeds of the duties, either on the old or an enlarged scale, to the Road Improvement Fund would enable the Road Board to make some contribution to the £30,000,000 required, but such contribution would represent but a small proportion of the total.

In this connection, it may be mentioned that, shortly before the outbreak of war, proposals were under consideration by the government for the classification of the roads and a revision of the Exchequer Grants to local authorities in respect of their expenditure on various semi-national services, including roads. The Road Board, at the request of the Local Government Board, had undertaken to classify the roads in England and Wales, as such classification was an essential preliminary not only to a sound scheme of state aid, but also to any general scheme of reconstruction. The classification was nearing completion on the outbreak of war, when the work was suspended. It will be practicable, however, to continue the work from the point at which it was broken off as soon as the board receive authority to proceed.

On the subject of the second class of work the communication reads as follows:

Although, as a class, all such works as new roads, widenings, etc., are of secondary importance, as compared with the reconstruction of the road crusts of important roads, there are some which are of considerable value and should be carried out side by side with road crust improvements. Applications in respect of such works have been received by the board, and a number have been approved by them as suitable for assistance from the Road Improvement Fund as works which may be carried out as soon as circumstances permit. A list of these works is annexed hereto, the total estimated cost in England and Wales being £1,314,152. It must be understood, however, that this list includes only such works as have been made the subject of an application to the board.

There are similar works which would be deserving of assistance as soon as the urgent works of reconstruction are completed or funds are available. The cost of works in this class which may have to be taken in hand at some time or other would probably not be less than £5,000,000.

Speaking of the third class, bridges, the board said:

There are a very large number of bridges in all parts of the country which require reconstruction. The Middlesex Highway Authorities, for example, have made an application to the Road Board for grants towards the reconstruction or widening of 22 bridges, the cost of which is estimated by the Councils at upwards of £150,000. In every county there are a large number of bridges vested in highway authorities or owned by railway and canal companies which are scheduled as capable of carrying vehicles of only a limited tonnage, with the result that a very large mileage of roads—often important roads—are closed to traction-engine and heavy motor car traffic, until such time as these bridges can be reconstructed.

A recent decision of the House of Lords will have the practical effect of throwing, in most cases, upon highway authorities, the cost of the reconstruction of weak bridges carrying public roads over railways and canals. It may be roughly estimated that the expenditure necessary to reconstruct bridges on important roads so as to support the motor traffic legalized by Parliament will not be less than £7,000,000. This is a very conservative estimate.

The schemes for the construction of new roads and bridges and various improvements, that have been put forth from time to time, have not been considered in detail, the board states, in the absence of any prospect of financing them while the more urgent work of road crust improvement is in progress. These proposals are grouped as follows:

(a) New approach roads to large towns, e.g., new road into Portsmouth to relieve the present single thoroughfare into that town and port.

(b) New bridges giving additional communication, e.g., a new bridge over the River Severn to connect the industrial districts round Stroud with the Forest of Dean and to shorten the road journey from the Bristol area to Newport and Cardiff.

(c) New roads to connect county boroughs, e.g., Liverpool and Manchester, Eastbourne and Hastings, Birmingham, Dudley and Wolverhampton.

(d) New bye-pass roads to avoid narrow villages, e.g., the Colnbrook Bye-Pass on the Bath Road.

(e) Improved communications and widenings in urban areas, involving high cost due to the purchase of buildings.

(f) Improvement and reconstruction of important through routes.. involving the purchase of property and costly work, e.g., the improvement of Watling St. from Weedon in Northamptonshire to Wellington in Shropshire, a distance of over 50 mi.

These and similar schemes, the aggregate cost of which would amount to many millions have not been examined or estimated in detail by the Road Board in conjunction with the local authorities, nor has the relative public value and cost been appraised, a work which would involve a large expenditure of time and money, for the reasons already mentioned. It may be assumed that, in almost every case, the local authorities affected would not be prepared to accept financial responsibility for schemes of the character under discussion, and that their contributions towards them, except in the case of some urban widenings of only local importance, would represent but a very small fraction of the cost. * * *

Of a somewhat similar nature are the proposals of the recent

Metropolitan Arterial Road Conferences for the construction of about 130 mi. of approach roads to London, 70 mi. being entirely new. The Local Government Board have requested the Road Board to examine these schemes, which, taken together, if their execution were proceeded with continuously, might involve an expenditure by all parties concerned of considerably over £10,000,000, and it might approach £15,000,000.

As regards Scotland, the mileage of roads requiring reconstruction and strengthening over and above the mileage that can be dealt with by the local authorities themselves out of their own resources may be taken at about 2,000 mi. at an average expenditure of £1,500 per mi., or a total of £3,000,000.

No estimate can be given as regards Ireland, but it may be mentioned that the special circumstances which have caused the great increase in road expenditures in England and Wales, and in some parts of Scotland, due to the large volume of motor traffic, have not hitherto pressed with any severity upon the highway authorities in Ireland.

The Apportionment and Assessment of Paving Costs in New Orleans, Louisiana

Practically the entire cost of paving and repaving in the City of New Orleans is borne by the owners of abutting property, payment being made in installments running for a period of not less than three years for sidewalk work and not less than ten years for roadway work. These payments are applied to the retirement of paving certificates issued by the city to meet the cost of the work in the first instance.

The methods of apportionment and assessment together with provisions governing the procedure in petitioning for pavements and selecting the types to be laid, and also definitions of the various terms used, are contained in a law passed by the General Assembly of Louisiana in 1916.

The paving of any street may be ordered by the commission council upon its own motion or upon petition signed by 60%, or more, of the owners of real property abutting on the street. In either case, bids are invited for all suitable types of pavements. Within 30 days after the publication of the low bids the owners of property abutting upon the street may petition the commission council, designating the kind of pavement preferred. The commission council must adopt any type or types of pavement designated by the owners of 33% of the property affected unless the character of traffic calls for a different type, in which case the council may select the proper type. If a more expensive pavement is selected by the council, the city must bear a portion of the cost equal to the difference between the cost of the two pavements. The city may bear the entire cost if the commission council so determines.

The entire cost of original paving between street intersections is borne by the owners of abutting property and is apportioned in accordance with the foot frontage of the property. One-half the cost of such paving at intersections is borne by the owners of property abutting on the street paved and one-half by the owners of property abutting on the intersecting street within a half block on each side of the intersection, the apportionment again being made on a foot frontage basis. If the area of the intersection to be paved exceeds 360 sq. yd., the cost of paving the excess yardage is borne by the city.

"Original paving," according to the law, includes grading, the construction of the foundation and wearing surface, the laying of new curb and counter curb, the relining and resetting of existing curb and counter curb, the paving of the gutters, the construction of culverts, the laying of subsurface drains not exceeding 10 in. in diameter, the construction of manholes and catch basins, and incidental work. There is also assessed upon the owners of abutting property the cost of such of the following work as may be done in front or at the side of their property: Grading, taking up and relaying of sidewalks not at the established grade, the installation of house drains, the repair of sidewalks, the construction of new sidewalks, the substitution of modern for antiquated sidewalks, and the construction of driveways.

The repaving of roadways, according to the law, includes essentially the same work as that included in original paving, except that it also includes the removal of old pavements. Its cost, when the work is ordered by the commission council upon petition of the property owners, is apportioned to the owners of abutting property in the same manner as is the cost of original paving, unless the roadway shall have been paved within 20 years previous to the action of the commission council in ordering the repavement, in which case one-half of the cost is borne by the city.

When sidewalks or banquettes are paved for the first time, the cost is apportioned to the owners of abutting property in essentially the same manner as is the cost of roadway paving. The cost of repaving sidewalks or banquettes, when ordered by the commission council upon petition of the property owners, is apportioned in the same manner as the original paving of sidewalks or banquettes. If the repaving is ordered by the commission council upon its own motion, one-half of the cost is apportioned in the same manner as is the cost of the original paving and the other half of the cost is borne by the city of New Orleans.

Assessments for the payment of the cost of paving are levied and collected by the commission council. Payments to meet the cost of the original paving of roadways or the repaving of roadways must be made in not less than ten equal annual installments. Payments to meet the cost of the original paving of sidewalks or banquettes or the repaving of sidewalks or banquettes must be made in not less than three equal annual installments. In all cases, interest at the rate of 4½% annually is paid on all deferred payments. A property owner, however, may pay the entire amount of his assessments at any time during the period of his indebtedness. If such payment is made on or before Oct. 15, interest must be paid on all of the unpaid assessments to and including Dec. 31 next ensuing. If payment is made after Oct. 15, however, interest is paid on the unpaid assessments to Dec. 31 of the year following that in which the payment is paid.

Certificates covering the estimated cost of paving in any year are issued by the city, advertised and sold to the highest bidder. The entire amount of certificates may be sold at one time or they may be sold in installments. The certificates are issued in denominations of $100, $500 and $1,000, bearing interest at 4½% annually from Jan. 1 of the year of their issue until paid. They may not be sold for less than 95% of par value, par value meaning principal and interest accrued to date of delivery. The certificates issued in connection with paving of roadways extend for a graduated period of eleven years, maturing in ten equal annual installments. Certificates issued in connection with banquetting or the paving of sidewalks or banquettes, or the repairing of streets, extend for a graduated period of four years maturing in three equal installments. While the city must redeem one-tenth of each issue of roadway paving certificates and one-third of each issue of banquetting or sidewalk paving certificates, a greater amount may be redeemed by the city, provided notice of its intention to do so is published sufficiently in advance.

Increase in Motor Vehicle Traffic in Pennsylvania

According to figures made public by the Pennsylvania State Highway Department, the motor license receipts in Pennsylvania from Jan. 1, 1917, to Sept. 30, 1917, aggregated $3,204,606 as against $2,268,942 for the same period in 1916, or an increase of 41%. An increase of nearly 38% is shown over the fees derived from these sources during the entire year of 1916, when the total was $2,325,057.50.

It is stated that Pennsylvania now has one motor vehicle for every 27 inhabitants and seven motor vehicles for every 2 mi. of public roads, and that the enormous increase in tonnage passing over the main highways of the state is due to the rapid increase of motor truck traffic.

Registrations for motor vehicles for the first 9 months of 1917 exceed, in all classes, those for the entire year of 1916. Solid-tired motor vehicles, weighing 4,000 to 5,000 lb., show the largest increase in any class, 3,084 having been registered as against 1,550 during 1916, an increase of nearly 100%. Solid-tired motor vehicles, of 5,000 to 10,000 lb., number 8,078, as against 5,163 in 1916. Trucks weighing from 10,000 to 15,000 lb. increased during the same period, from 1,582, in 1916, to 2,360, while the class weighing from 15,000 to 24,000 lb. number 1,631, as against 1,081 during 1916.

The lighter trucks, of less than 4,000 lb., show an increase of only 121 over the registrations for 1916 when 1,933 were registered, 2,054 being the number for 1917.

During the year 1915 there were 8,139 solid-tired motor vehicles registered in the state; in 1916, the number was 11,732, and for 1917, as of Sept. 30, there were 17,726. A greater proportionate increase is shown in the heavier type of trucks during 1917, the percentage of increase being 51% for solid-tired motor vehicles and 36% for those with pneumatic tires.

The registration of pneumatic-tired motor vehicles—297,660—shows a greater increase in cars of lower horse power, as follows: Under 20 hp., 43%; 20 to 34 hp., 36%; 35 to 49 hp., 12%; above 50 hp., 25%. In 1915 the registrations numbered 152,024, and in 1916, 218,846.

From Jan. 1 to Sept. 30, 1917, 2,720 tractors were registered, as again 2,701 during 1916, a gain of only 19%, and 15 of these were free registrations.

Trailers increased from 496, in 1916, to 806, showing a further development in this new phase of transportation over the state's highways.

Motorcycle gained only about 12%, 24,062 being registered, while the total for the year 1916 was 21,439.

The heavy traffic on state roads, particularly on the Lincoln Highway, by the enormous freight trucks now running, has already started to play havoc with the highways. In certain sections this important route has begun to break and is likely to have to be rebuilt next spring. When the present roads were built, it was never thought that they would have to support such an immense tonnage as is now passing over them daily.

If the increases indicated by this survey continue for the next few years, especially in motor truck traffic, the highway problem in Pennsylvania will assume such proportions as to dwarf many other big questions with which the commonwealth has to contend.

Up to Oct. 22, the Automobile Division of the State Highway Department had taken in $5,186.00 for 1918 motor vehicle licenses. Automobile owners, drivers and motorcyclists are urged to send in their applications at an early date in order to avoid congestion, if possible, in the Automobile Division at the end of the year.

California Counties Want Another State Bond Issue

The good roads committee of Merced County, California, and the executive committee of the Yosemite-to-the-Sea Good Roads Association have taken steps toward securing another state bond issue to lessen the cost to Merced and other counties of the construction of proposed state highway laterals. Fourteen counties affected have been asked to join in the movement.

The advance in material prices, which it is estimated will raise the cost of proposed lateral roads, from $6,000,000 to $9,000,000 is said to be responsible for the action of the above organizations.

The supervisors of Merced, Madera and Santa Clara Counties recently had a meeting with the State Highway Commission concerning Pacheco Pass Highway. The estimated cost of this lateral is $1,617,994, the state's share being one-third.

First Quarterly Report of the Texas State Highway Commission

The first quarterly report rendered by the State Highway Commission of Texas contains a summary of receipts and disbursements to Oct. 1, 1917.

The receipts on account of licenses for 176,869 automobiles amounted to $734,569.80; for 3,067 motorcycles, $4,600.60; 1,008 dealers, $11,071.50; 1,407 transfers, $1,407.00; 7,461 chauffeurs, $14,922; total, $766,570.80. The disbursements on account of administration amounted to $9.993.52; motor registration, $26,015.52; equipment, $7,011.27; engineering, $4,037.10; project No. 1, in Travis County, $301.55; first allotment to counties Sept. 1, 1917, $342,193.36; checks unpaid and charged back, $202.94; all paid back, except $35.94; balance in bank and treasury, $376,815.54; total, $766,570.80.

Death of James Lawrence Gaynor

James Lawrence Gaynor, a well known road builder, of Scranton, Pa., died recently at his home in that city after an illness of only thirty-six hours.

Mr. Gaynor, as head of the Gaynor Contracting Co., devoted the greater part of his time to highway, bridge and other construction work. A notable contract executed by his company was the widening of the barge canal between Lyons and Clyde, N. Y., several years ago.

He was born in Scranton where he went to school until fifteen years old, when he took a position with the Bell Telephone Co., afterwards going into the busines of road and municipal contracting.

Mr. Gaynor was a leader in the social and civic life of Scranton, and was identified with a number of organizations there and elsewhere. He was vice president of the Engineers' Society of Northwestern Pennsylvania, a member of the American Society of Civil Engineers, the American Road Builders' Association, the Permanent International Association of Road Congresses, and a number of social clubs. He left a wife and three sons. He also is survived by three brothers and one sister.

Toll Roads in Pennsylvania to Be Abolished

Negotiations are pending between the State Highway Department and fifteen counties in Pennsylvania for the freeing of approximately 164 mi. of toll roads in the state, according to advices from the department. Prices have been agreed upon, and the papers now are being prepared by Attorney General Brown for the freeing of the following turnpikes:

Danboro and Plumsteadville toll road, in Bucks County, 2½ mi. long; purchase price, $8,167, of which the state will pay $3,250.

Cornwall Turnpike, in Lebanon County, 4 mi. long; purchase price, $6,250; state's share, $3,125.

Duncanville and Newry Turnpike, in Blair County, 4 mi. long; purchase price, $5,000; state's share, $2.500.

The papers have also been signed for the freeing of the Mt. Pleasant and Donegal tool road, 6½ mi. long, situated in Fayette and Westmoreland Counties. The freeing of this road, however, has been held up on some technical point by the county controller of Westmoreland County.

Commissioner O'Neil is strongly in favor of the abolition of toll roads, and hopes that by the first of the year many may be closed. It is his intention to prepare an estimate of the cost of freeing all the toll roads in Pennsylvania and present it to the 1919 session of the Legislature with a view to securing a sufficient appropriation to abolish all such roads in the state.

A statement of toll roads purchased by the state from June 1, 1913, to July 16, 1917, appeared in the issue of Aug. 11, 1917.

Examination for Assistant Highway Engineers in Tennessee

An examination for state highway engineers will be held by the Tennessee State Highway Department in the Capitol Building at Nashville, on Nov. 19.

In compliance with a recent law enacted by the Legislature highway engineers cannot be employed by the state until they have passed an examination before an examining board composed of the state highway engineer, the dean of engineering at the University of Tennessee, and the state geologist.

The object of this examination is to qualify engineers for appointment for highway work in connection with the federal and state aid projects within the state. The immediate employment of from ten to twelve additional engineers for this work is contemplated by the state. Other positions will be open for instrumentmen, rodmen and chainmen to make up ten or twelve parties. No examination is required for the latter positions, but the applicant must show his fitness for the work.

The State Highway Department is now preparing a number of projects to be passed upon by the federal government with a view to immediate construction, and has designated the unimproved portions of the Memphis-to-Bristol Highway, 610 mi. in length, and the Dixie Highway, 207 mi. in length, as the first projects to be improved under the federal and state aid systems.

Information concerning the positions above referred to or the work may be obtained by addressing A. M. Nelson, State Highway Engineer, Nashville, Tenn.

Washington County, Kentucky, Alive to the Value of Good Roads

By W. N. BOSLER*

Washington County, although not a wealthy county financially, has several hundred miles—to be exact about 275 mi.—of macadam roads built years ago before the advent of the automobile when macadam roads withstood the steel-tired traffic. The county also has about 200 mi. of earth road.

The road fund is only about $15,000 per year, which entitles the county to between $5,000 and $6,000 of state aid annually. In recent years, because of the heavy automobile traffic, the roads have badly deteriorated but for the past three years, or since the state aid law has been in effect, the county has regularly availed itself of the aid. In 1915, about 4.5 mi. were resurfaced; in 1916, about 8 mi.; and in 1917, about 4 mi. The cost of the work in the years 1915 and 1916 was approximately $1,500 per mi., but during 1917 it has been about $2,000 per mi. The increase this year is due to the fact that a great many more drainage structures have been required on the roads than on those formerly built and also to the increased cost of labor and material.

Too much praise cannot be given the County Judge, J. S. Yankey; County Attorney, Joe Polin; County Road Engineer, Gilbert Donohue, and, in fact, the entire fiscal court. They deserve the praise of every citizen in Washington County and every taxpayer in the state for the active interest they have taken in the good roads movement.

Owing to the fact that the officials have taken such a deep interest in the road work, the county has been able to do force account work most successfully, whereas it is the experience of most engineers that road work done by force account methods is a failure.

It is the purpose of the officials to resurface, in time, every county seat road and every other road in the county under the state aid system.

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*Division Engineer Department of Public Roads of Kentucky.

Advice to County and District Engineers in Minnesota

State Highway Commissioner C. M. Babcock, of Minnesota, has sent a warning to county and district engineers throughout the state that now is the time to put the roads into the best shape possible before winter begins, to avoid heavy damage from spring rains and floods.

The engineers are advised to clean ditches and culverts, to open lines of drainage, and to reshape and recrown the roads before the first heavy snow is on the ground. They are also instructed to complete as much as possible of the preliminary field work for next year's operations.

Highway Bond Elections in Texas

A road bond issue for $100,000 was recently carried in Road District No. 9, Limestone County, Texas. Other issues have been passed as follows: Orange County, Road District No. 3, $30,000; Jasper County, $500,000; Paris, $20,000.

Elections have been ordered in the following counties: Smith County, Troup Road District No. 6, $60,000, Nov. 3; Cameron County, $200,000, Nov. 3; Anderson County, Road District No. 3, $40,000, Nov. 10; Navarro County, Powell Road District, $60,000, Nov. 10; Nolan County, $100,000, Nov. 10; Jones County, $200,000, Nov. 10; Wilbarger County, Road District No. 1, $105,000, Nov. 15; Jefferson County, $500,000, Nov. 17.

Bond issues have been proposed for the following counties and amounts: Hays, $40,000; Callahan, $50,000; Mitchell, $70,000; Wise, $80,000; Fisher, $200,000.

Call for Highway Bids by the Pennsylvania State Highway Department

Commissioner O'Neil of the Pennsylvania State Highway Department is advertising for bids for the construction of improved roads in Allegheny, Somerset and Venango Counties. The bids will be opened on Nov. 8.

The section of roadway to be improved in Allegheny County extends through Ross and McCandless Townships, from the end of a brick road north of Perrysville, to a point about ½ mi. north of Pine Creek Crossing, a distance of 21,426 ft. It is designated as Sec. 1 of State Highway Route 246. The construction is to be of reinforced concrete or bituminous concrete.

The Somerset County project is located in Lincoln and Jenner Townships and Jennertown Borough, being Sec. 2 of State Highway Route 269. It extends from the north line of Somerset Township to the intersection of State Highway Route 119, in Jennertown Borough, for a distance of approximately 39,340 ft. This pavement is to be of reinforced concrete or bituminous concrete and hillside block construction, 16 ft. wide.

The Venango County road extends from the north line of Oil City to the south line of Rouseville, through Cornplanter Township, a distance of approximately 7,857 ft. This pavement is to be of vitrified block construction, 16 ft. wide.

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A Greater Use of Convict Labor in Minnesota will be one of the remedies for the labor situation, according to the belief of State Highway Commissioner C. M. Babcock, of that state. One of the first uses of such labor will be on the roads, according to Commissioner Babcock. "A rising premium on labor, partly caused by the withdrawal of a million men from industry, is driving all parts of the country to a realization of the necessity of employing to the greatest profit thousands of prisoners who are now a public liability instead of an asset," said Mr. Babcock. "In our state prison and reformatory the men are well employed at productive labor, but so much cannot be said of county and town prisoners. In Missouri the checking of the state road program by the shortage of labor was met by the use of convict labor. It is only a question of time before Minnesota takes the same step."

MEETINGS

Calendar of Coming Meetings

Nov. 19-20.—National Paving Brick Manufacturers Association.—Annual meeting, Cleveland, Ohio. Secretary, Will P. Blair, 830 Engineers Building, Cleveland, Ohio.

Nov. 19-24.—City Managers' Association.—Annual meeting, Detroit, Mich. Secretary, W. L. Miller, City Manager, St. Augustine, Fla.

Nov. 21-24.—National Municipal League.—Twenty-third annual meeting, Hotel Statler, Detroit, Mich. Secretary, Clinton R. Woodruff, 703 North American Building, Philadelphia, Pa.

Dec. 4-6.—American Association of State Highway Officials.—Annual meeting, Hotel Jefferson, Richmond, Va. Acting Secretary, H. M. Berry, Chapel Hill, N. C.

Jan. 15-17, 1918.—Virginia Good Roads Association.—Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

Pennsylvania State Good Roads Association

A convention of the Pennsylvania State Good Roads Association was held at the Brunswick Hotel in Lancaster, Pa., on Friday, Oct. 26. W. A. Wynn, Engineer of the Bureau of Township Highways of the State Highway Department, was one of the principal speakers. Mr. Wynn represented State Highway Commissioner O'Neil, who was making an inspection tour at the time of the meeting and was therefore unable to be present.

National Municipal League

The dominant theme of the annual meeting of the National Municipal League, to be held at Detroit, Mich., Nov. 21 to 24, will be the problems of cities during war times.

One of the questions to be discussed in conjunction with the City Managers' Association, which will meet in Detroit at the same time, is "Will the City Manager Form of Government Fit All Cities?" Budget making and training for public service will also come in for a share of attention.

American Highway Association

The American Highway Association was dissolved by vote of its board of directors at a meeting on Oct. 30.

The association was organized at a meeting held in Washington, D. C., in November, 1910, in response to a call issued by Logan Waller Page, Director of the Office of Public Roads. It was first designated as the American Association for Highway Improvement and had for its stated object "to harmonize and correlate all efforts for the improvement of the public roads, to the end that adequate and efficient systems of road construction, administration and maintenance may be adopted in all of the states."

Its first convention was held at Richmond, Va., Nov. 20-23, 1911. Other annual meetings were held as follows: Atlantic City, N. J., Sept. 30-Oct. 5, 1912; Detroit, Mich., Sept. 29-Oct. 4, 1913; Atlanta, Ga., Nov. 9-13, 1914, and the Pan-American Road Congress, held jointly with the American Road Builders' Association, Oakland, Cal., Sept. 13-17, 1915.

Mr. Page was the first president of the organization and held that office until succeeded by Fairfax Harrison, President of the Southern Railway. Mr. Harrison was elected at the Atlanta convention in 1914 and remained president until the dissolution of the organization.

It has been announced that the surplus funds of the association have been invested in Liberty Bonds and that the interest will be used for an American Highway Association prize "to be awarded annually by the secretary of agriculture for conspicuous service in the advancement of road improvements in the United States."

PERSONAL NOTES

G. J. Wagner has been appointed City Engineer of Grand Rapids, Mich.

F. M. Churchill has been appointed Highway Commissioner of York County, Nebraska.

E. C. Hurd has been made City Engineer of Havelock, Neb., succeeding L. S. Biddlecom, resigned.

Herman C. Allen, of Wallace, Idaho, has been appointed State Highway Engineer, succeeding Eugene M. Booth, whose resignation took effect Nov. 1.

Eugene M. Booth, who was appointed State Highway Engineer of Idaho in 1915, has resigned the office and will enter the service of the government in an engineering capacity.

Homer Hamlin, who resigned as City Engineer of Los Angeles, Cal., last summer, has entered the practice of consulting engineer and geologist. His offices are in the Central Building, Los Angeles.

R. J. Windrow, County Engineer of McLennan County, Texas, has been appointed by Governor Hobby, a member of the State Board of Water Engineers, to succeed J. C. Nagle, who recently resigned.

W. F. Collar, who has had charge of the building of the east approach of the Municipal Free Bridge in St. Louis, Mo., is now with the Foundation Co., of New York, with which he was formerly connected. His headquarters are at Chicago, Ill.

A Special Committee Has Been Appointed in Saginaw County, Michigan, to determine the best highway law for the county, based upon a consideration of the special county road act passed by the last Legislature and the general state highway law.

A State Road Between Cabool and Willow Springs, Texas County, Missouri, is under construction. The road is an important link in the Springfield-Memphis Highway, and intersects the **Ozark Scenic Highway** between Springfield and St. Louis, at Cabool.

The First State Road Constructed in Missouri connects with the state road system of Arkansas at a point due north of Harrison, and it is estimated that when the road now under construction between the Arkansas line and Branson, Taney County, is extended north to Springfield, there will be more than one hundred motor cars pass over it daily. Taney County, with beautiful Lake Taneycomo, is one of the most attractive resort sections of Missouri, and tourist travel will keep pace with the improvement of the roads. This road is also a link in the highway connecting Springfield with Little Rock and Hot Springs.

The New York State Mounted Police, under the Department of Public Service, will shortly patrol the roads and rural districts of Long Island, according to report. Major George Fletcher Chandler, who was in the National Guard for a number of years and who served for eights months on the Mexican Border as brigade adjutant of the First New York Brigade, and as range officer for the New York Division, is Superintendent of the department. The uniform of the members is of the English army pattern, of smoked gray color, with gray flannel shirts, and broad-brimmed hats. The mounted police will operate in pairs. The Department of Public Service was created by a bill which received the signature of the governor in May last.

GOOD ROADS

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THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LII.
New Series, Vol. XIV.

NEW YORK, NOVEMBER 10, 1917

Number 19

An Experimental Slag Macadam Road in Greenup County, Kentucky

By C. S. BENNETT.*

During the past two construction seasons, there has been put down in Greenup County, Kentucky, a section of water bound macadam road in which blast furnace slag was used as the road metal. Limestone of a suitable quality for surfacing could not be obtained at a reasonable cost, as there is practically no limestone in the county, while there are several blast furnaces just across the Ohio River from the road that was built.

As this was the first piece of road of this kind built in this part of the state several different methods of construction were tried. These several methods and the results obtained will be described.

Before work was commenced, several typical samples of the slag were tested by the usual methods to determine their qualities as road building material. The average of the results of the tests was as follows:

Specific gravity	2.60
Percentage of wear	4.96
Hardness	15.2
Toughness	9.0

These results indicated that the slag would make an excellent surfacing material.

The subgrade was carefully and easily shaped by the use of a blade grader. It was then thoroughly rolled and all soft spots carefully filled with stone, after which rolling was continued until a firm subgrade had been obtained.

The first mile was divided into four sections, upon each of which a different method of placing and treating the surfacing material was followed. On the first section slag of a size known as No. 1 (from 2 to 4 in. in size) was placed on the prepared subgrade to a depth of 6 in., loose. This course was rolled until thoroughly compacted. Another layer of slag of the size known as No. 2 (from 1 to 2½ in. in size) was then spread to a depth of 6 in. and rolled down to 4 in. Screenings were spread over the surface and brushed and rolled in dry until all interstices were filled. After the completion of this filling, the road was rolled, watered and treated with screenings in the usual manner until a thoroughly water bound surface was obtained.

On the second section of the road, a first course of the same size material as that used in the first course on the first section was put down. Before adding the second course material, the first course was treated with screenings and water bound, as if it were to be the finished surface. Second course material consisting of No. 2 slag was then placed and the roadway completed as on Section 1.

VIEW ON SECTION 2, EXPERIMENTAL SLAG MACADAM ROAD, GREENUP COUNTY, KENTUCKY.

VIEW ON SECTION 4, EXPERIMENTAL SLAG MACADAM ROAD, GREENUP COUNTY, KENTUCKY

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*State Road Inspector and Engineer, Greenup, Ky.

On Section 3, both courses were of No. 1 slag, only the top course, however, receiving the screenings and water.

Section 4 was built in the same manner as Section 2, except that No. 1 slag was used for both courses.

The road has been open to traffic for about eight months. Frequent observations have been made on the four different sections for the purpose of determining which is giving the best service. These observations show the following:

On Section 1: Considerable wear in wheel tracks and some loosening of top course material.

On Section 2: Loosening of top course material to some extent and not so much wear noticed.

On Section 3: Wear in wheel tracks, causing baring of the second course material.

On Section 4: No loosening of material observed and very little wear, even in wheel tracks.

From these observations, it has been concluded that the most satisfactory wearing surface is obtained by the use of coarse material for both courses and the thorough water binding of each course. The coarser material keys up better than the No. 2 slag, and if sufficient screenings are used to fill all the voids, a very solid and impervious roadbed is obtained. This method, of course, requires more screenings than would be needed were only the top course bound, but the results seem to justify the use of the additional material.

In many respects, the water bound slag macadam road seems to possess certain advantages lacking in the limestone type. The slag screenings appear to have a greater binding power than the limestone dust; in several places where slag has been left undisturbed for some time, it has been found to be cemented together very much like Portland cement concrete.

It was noted that far less dust occurred on the slag road than on an adjacent section of limestone macadam.

The work described was done under the direction of the State Department of Public Roads of Kentucky. T. B. Webber was division engineer and the writer was resident engineer in charge.

State Highway Funds and Contracts in Pennsylvania

The aims and activities of the State Highway Department, with reference to contracts and township work were presented in a recent address by W. A. Wynn, Engineer of the Bureau of Township Highways, before the Pennsylvania State Good Roads Association.

Mr. Wynn declared that the State Highway Department was letting contracts as rapidly as conditions would permit, although not as rapidly as had been hoped by the department officials, due to scarcity of labor and inability to get delivery of materials. The unusual prices resulting from these conditions, in most cases, were considered excessive, he said.

In referring to legislative appropriations and available funds he gave the following statement covering the two years ending June 1, 1919:

State aid construction in boroughs and townships	$1,500,000.00
State highway construction in boroughs, counties and townships	6,000,000.00
Purchase of turnpikes	500,000.00
Federal Aid:	
Year ending June 30, 1917	230,644.17
" " June 30, 1918	461,288.34
" " June 30, 1919	690,145.78
Total from state and federal governments	$8,382,078.29

The township bonus money—$1,873,470.40—is not figured in the total amount as the State Highway Department does not have direct control over its expenditure, the township supervisors themselves having charge of the spending of this money, in accordance with the rules of the department.

In addition to the above, Engineer Wynn stated that several millions of dollars could be depended upon from the counties and townships.

PENNSYLVANIA CONTRACTS AWARDED OR READY FOR AWARD ON OCT. 26, 1917

County	Township or Borough	Length (ft.)	Type	Contract Price
Luzerne	Shickshinny B.	6,285	Brick	$51,178.77
Clarion	Clarion & Paint	14,128	Brick	103,625.00
McKean	Wetmore	22,101	Brick	144,249.80
Beaver	White and Big Beaver	23,546	Concrete	145,198.70
Cambria	Jackson	11,975	Brick	86,278.20
Lackawanna	S. Abington	7,821	Bituminous	51,218.60
Beaver	Moon and Hopewell	9,299	Grading and drainage	18,851.50
McKean	Foster	8,367	Concrete	43,777.00
Fayette	Washington	6,513	Brick	45,825.40
Cambria	East Taylor	9,878	Brick	78,855.43
Cambria	Jackson and East Taylor	11,070	Brick	95,881.60
Butler	Clinton	5,800	Brick	80,255.97
Montgomery	Up. Moreland Upper Dublin Abington	6,537	Concrete	44,349.60
Westmoreland	E. Huntingdon	2,540	Brick	20,955.70
Armstrong	Manor	13,007	Brick	131,468.20

The automobile license money which is used to maintain the state highways amounted on Oct. 17 to $3,230,295.50.

Although the greater number of bids received by the department have been excessive, a few of the bids have been considered as the best that could be obtained under existing conditions. In these few cases, contracts were let only after the local authorities, who are subscribing half of the cost, had been consulted.

The accompanying table shows contracts that had been awarded or were about to be awarded on Oct. 26:

These contracts represent a total of about 30 mi. Mr. Wynn stated that other bids would be received for proposed work, and if prices seemed reasonable, contracts, no doubt, would be let.

The construction of state and state aid roads and their maintenance is the work of the State Highway Department, but, as explained by Mr. Wynn, the department is also vitally interested in the proper administration of the township road system. The Legislature appropriated $1,873,470.40 to cover the deficiency due to the second-class townships for the years 1910, 1911 and 1912. Existing laws provide that each second-class township shall receive 50% of the cash collected, but not to exceed $20 a mi. It is stated that this percentage was so high that the Legislatures in the past were unable to appropriate a sufficient amount to pay the various townships in full, and that after the above amount is paid there will exist a deficiency for the years 1913 and 1914. It is expected that the deficiency will be wiped out by legislative appro-

(*Continued on page 244*)

Some Drainage Problems Encountered on Maine Highways

By H. WALTER LEAVITT.*

Any highway construction engineer knows that proper drainage is the greatest essential of satisfactory road foundations. To obtain such foundations, however, the engineer must be enough of an agronomist and geologist to understand the texture and structure of soils. This is especially true in the glacial drift regions of New England, for there many and very different formations are encountered. Some of the most common stratifications are shown in the accompanying sketches.

In Fig. 1 is shown the cross-section of a very common formation, which is most detrimental to a road foundation in level stretches where the ditches are seldom free from water. In such a case the roadbed is continually saturated with water, due to capillarity.

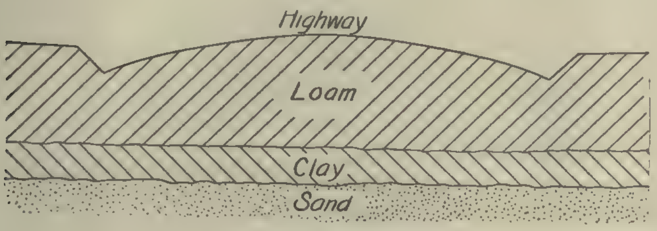

FIGURE 1.

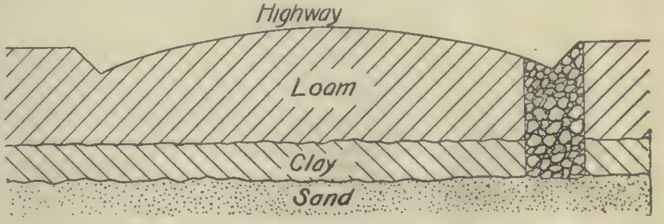

FIGURE 2.

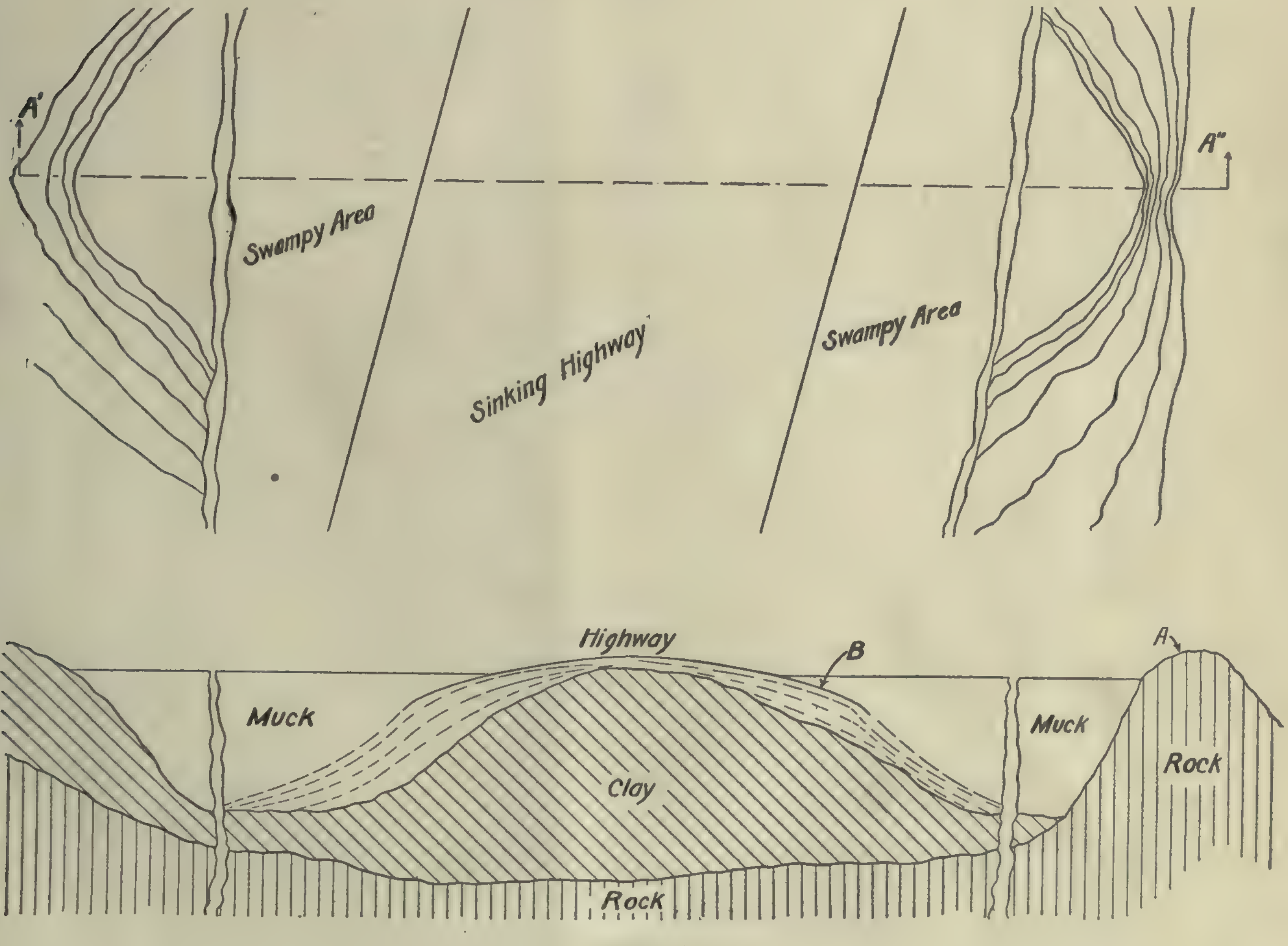

FIGURE 3.

Fig. 2 represents graphically a very easy remedy for the condition just described. Sump holes like that shown at the right should be put in frequently enough to keep the ditches dry.

Fig. 3 shows the topographical conditions on a famous sinking road in the state of Maine. The upper part of the figure is a plan and the lower part a cross-section on the line A'—A". (The sketch is drawn to scale, necessitating the indication of breaks in the drawing at the irregular lines on either side.) Every year the town appropriates $100 for the improvement of the road, and the fund is successively spent for so much earth, gravel or stone to raise the roadbed out of the muck. This has been done for fifteen years and the roadbed is still unimproved, because the fill gradually spreads out, as shown by the dotted lines at "B." The remedy is easy and cheap, as shown in the

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*Assistant Professor of Highway Engineering, University of Maine.

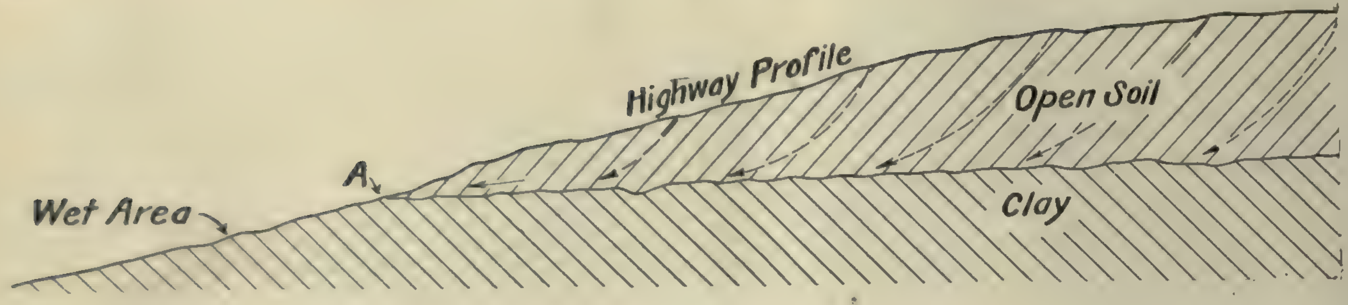

FIGURE 4.

cross-section. At the point "A," by excavating 50 cu. yd. of rock, the whole bog could be drained. The cost of that work would be approximately $3.00 per cu. yd., or $150 for the job.

Another very common condition is shown in Fig. 4. All seepage water falling above the point "A" must follow the course shown by the arrows, thereby resulting in the wet area, as shown below "A." Here there must be provided a lengthwise drain beside or beneath the roadbed. It is just such conditions as this that have made the "V" drain so famous with the Maine State Highway Commission.

A drain of this type is shown in Fig. 5. The cobbles, of which the drain is composed, have as a maximum diameter 8 in. Usually a sand or gravel cushion is placed over the top to a depth of about 2 in. Sometimes a tile pipe is laid at the vertex of the "V," but it has been found unnecessary if the drain is properly constructed and the grade is more than 2%.

Referring again to Fig. 4, suppose we have a highway located at "A," at right angles to the one just discussed, and following the contour line cut by the impervious clay sheet. If it is not feasible to change the location the remedy would be as shown in Fig. 6.

Many more illustrations might be given, but these few will prove that a study of soil texture and stratification is essential.

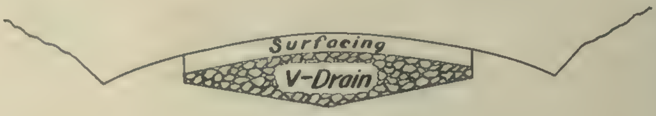

FIGURE 5.

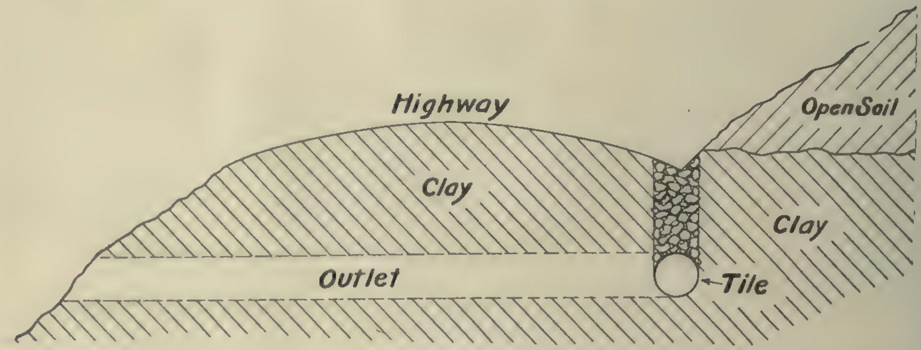

FIGURE 6.

State Highway Funds and Contracts in Pennsylvania

(*Continued from page 242*)

priation and that some system of appropriation will be adopted whereby each township will know definitely how much will be received by it each year.

According to a ruling of the State Highway Department, all of the money received by each township must be spent for permanent work, and the following classification was given of the various kinds of work considered as permanent:

1. Buying and installing concrete, cast iron and corrugated pipe and the building of concrete or stone masonry headwalls.
2. Construction of concrete and cement masonry culverts and bridges, built according to the standards of the Bureau of Township Highways of the State Highway Department, or from plans approved by the bureau.
3. Construction of steel bridges, plans for which have been made or approved by the Bureau of Township Highways.
4. Permanent improvement of alignment of road.
5. Permanent improvement of grade of road.
6. Permanent widening of roads.
7. Construction of brick roads.
8. Construction of concrete roads.
9. Construction of water bound macadam roads.
10. Construction of bituminous macadam roads.
11. Construction of slag roads.
12. Construction of gravel roads.
13. Construction of flint roads.
14. Construction of concrete and stone masonry retaining walls to support roads.
15. Township's share of state aid road construction.

Engineer Wynn stated that it was almost a physical impossibility for the engineers of the department to see that the bonus money was used in each township according to these rules, but believed that a majority of the supervisors realized the importance of making such permanent improvements and were eager to comply with the rules of the department in the expenditure of the bonus money. He called attention to the neglect of some supervisors to consult the department concerning bridge work in particular, referring to inspections made in various parts of the state, and suggested that an effort be made to produce a higher type of work. He added that the idea of economy had been carried so far in some townships that bridges and culverts already constructed were falling to pieces either from insufficient foundations or poor materials. He urged a greater interest in the township road problem in the respective communities.

Nevada Highway Funds

The Nevada Tax Commission issued a statement recently concerning the money available for highway construction and improvement under the latest tax levy of 7%. The proceeds of this levy are to be expended under the direct supervision of the State Department of Highways, and will be applied to the improvement of important cross-state roads.

To the amount raised by taxation, the federal apportionments will be added, and also $25,000 of the state automobile license funds, appropriated by the last Legislature. The sum of $594,630 will be available for the use of the Department of Highways on through routes. In addition the eight counties traversed by the Lincoln Highway will have $108,300 for highway and bridge work.

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Number 19

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

NOVEMBER 10, 1917

ROAD DRAINAGE

An old but none the less important subject is treated in a brief article entitled, "Some Drainage Problems Encountered on Maine Highways," printed on other pages of this issue. The matter of drainage, perhaps more than any other fundamental of road construction, is one that is almost universally recognized in theory and surprisingly neglected in practice.

Drainage should come first in the study of almost every road building problem, for without proper provisions for getting the water off and away from the road it is well-nigh impossible to get satisfactory results. This applies to reconstruction, repair and maintenance work as well as to original construction; to work in almost every climate and under nearly all conditions of topography and soil; and to country roads and city streets, under light or heavy traffic.

Most of the examples described and illustrated in the article to which reference has been made will be recognized by experienced road builders as typical of conditions they have encountered in their own work. They will also recall not a few instances where, as in the case of the "sinking road," a little thought and a few dollars would have remedied conditions and effected large savings.

It frequently happens that of two roads built in apparently the same manner, one remains in good condition most of the time while the other is almost always in poor condition and frequently is all but impassable. Not always, but very often, the reason for the difference will be found in the drainage.

While all of this is elementary and is thoroughly understood and intelligently applied by experienced road builders, it is, nevertheless, worthy of emphasis, for not all of our roads are under the care of officials of experience.

THIS ISSUE

This issue of "Good Roads" includes "The Highway Contractor and Road Builder," a publication devoted to the interests of contractors, especially those in New York and New England. As announced last week, the features peculiar to that periodical will be presented hereafter in the second issue of each month.

By this combination nothing will be taken from "Good Roads" nor will any change be made in its policies or its character. The only physical difference in the journal will be the addition, in the one issue, of the matter of local interest that has appeared in "The Highway Contractor." On the other hand, there will be added to the facilities of "Good Roads" for getting news and technical matter, those of the other publication.

"Good Roads" will continue to present the best thought of the time upon matters of interest to road builders, to print the current news of the road building field, and to stand for those principles of efficiency, economy and integrity for which it has always stood.

THE CONTRACTOR'S BURDEN

Commissioner Duffey, of the New York State Highway Department rendered praise where praise was due when, in speaking at the A. R. B. A. dinner on Friday of last week, he paid a tribute to the work of the contractors during the season now drawing to a close.

Few except the contractors themselves realize the handicaps they have worked under. For the past two seasons labor has been difficult to get and difficult to hold. Wages have constantly increased and at the same time the efficiency of the labor available has decreased. Car shortage, always a troublesome factor in the road contractor's operations, has become acute—to put it mildly—since the declaration of war. Prices for materials have risen steadily and deliveries have been uncertain. Other troubles less serious than those perhaps, but in the aggregate quite serious enough to often make the difference between profit and loss, have resulted from the circumstances attendant upon the country's entrance into the world war.

In spite of these hindrances and annoyances, work has been kept going in New York. According to Commissioner Duffey, only between sixty and seventy out of about three hundred and fifty contracts have resulted in disaster or complete stoppage. This is doubtless not greatly different from the accomplishments of contractors elsewhere and it speaks volumes for the courage, integrity and loyalty of the men under whose direction the actual work of construction is carried out.

◆

Annual Good Roads Day Was Celebrated at Corning, Cal., October 24, under the auspices of the Chamber of Commerce. Several hundred citizens, including women, joined in the work of improving the condition of the streets and roads.

The Improvement of Fifteen Roads in Allegheny County, Pennsylvania, for which contracts were let recently, will cost approximately $1,526,000, the total length of roadway to be improved being 20 mi., and the average cost about $76,000 per mi.

The Toronto-Hamilton Highway in Ontario, Canada, will be open to traffic on its entire length by Nov. 15, according to report. The erection of several concrete bridges on the highway, which have been decided upon, will not be undertaken until next spring, it is stated.

Texas Counties Have Ordered Road Bond Elections as follows: Freestone County, Road District No. 8, Nov. 10, $50,000; Houston County, Nov. 17, $50,000; Franklin County, Road District No. 3, $10,000, District No. 5, $11,000, District No. 4, $20,000, Nov. 17; Lynn County, Nov. 20, $60,000.

The Highway in Its Relation to Transportation[*]

By S. M. WILLIAMS[†]

I want to say a few words regarding the highway in its relation to the most important subject, transportation.

Transportation is the foundation of progress. Without transportation we cannot have production—labor would be helpless. Without transportation we could not gather raw materials or distribute finished products. And without transportation we would practically stand still in economic and social development.

In former times, in thinking of transportation our minds immediately went out to the railroads or the waterways. The highways were not considered except as matters of convenience for individual communities which they traversed; and, owing to the miserable and unreliable condition of the highways in many sections of the country, we have been paying a penalty of over $250,000,000 per year in excessive cost for transporting our agricultural products alone from farm to market or shipping point.

Transportation is not only one of the most important factors in building up any country, but today it is of still greater importance to the United States and the Allies in winning the war in which we are now engaged.

We should consider transportation from the economic viewpoint, and we should encourage development where it will mean the greatest good to the greatest number.

I am satisfied that, if never before, the day is now here when those responsible for transportation in its different forms are willing to study and recognize that type best adapted to the individual requirement. The railroads must be willing to concede that for some forms of transportation the waterways will better serve the economic needs of our country, and the waterways must recognize the efficiency of the railroads for that type of transportation where time is essential in the matter of delivery.

Both the railroads and the waterways must acknowledge that the highway is just as important for certain forms of transportation. In fact, to a very large extent it is the very foundation of both railway and waterway transportation; therefore the improvement of the highways must be encouraged and aided by all public carriers.

I predict the day when we will see the steam and electric railways and the waterways linked with the highways, each doing its duty for the building up of our great country. It must be so.

I was greatly surprised a few weeks ago in looking over the advance copy of the program for a great convention recently held in Atlantic City to find that they had recognized the great importance of transportation in winning the war by giving it one of the most important places on the program. Both the railways and waterways, the electric roads, and the motor trucks were down for discussion, but there was no provision for the consideration of the highway. Can you imagine an intelligent consideration of transportation without reference to the highway and its relation to every form of transportation?

When I approached some of those responsible for the convention I was politely informed that I would have as much chance to get the subject of highway improvement before the convention as a "snow ball would have in the lower regions."

That did not discourage me, however, and I am glad to say that with the hearty cooperation of a number of loyal workers, including Mr. Powers, a resolution was secured recognizing the value of the highway as a good, prompt and economical means to supplement transportation by rail and water, and that it is essential that all transportation facilities of the nation be brought to the highest state of efficiency in order that foodstuffs may be moved most economically from the farm to the market and that manufactured products be transported at the lowest cost from factory to consumer, therefore the prompt improvement of our public highways is important and should be forwarded in every proper way.

I am very glad to say that one of the strongest supporters of the resolution passed at Atlantic City is a prominent official of one of our great express companies—a man of national reputation for his farsighted and keen instinct in large affairs affecting the general welfare of our country.

This gentleman stated that as the head of one of our great public carriers he realized that the time was here when the railroads and the express companies were unable to meet the requirements of the country with efficient service, that wherever possible they must turn to the public highway for relief in the short haul, and that, therefore, the improvement of the highway was an important and economic necessity.

While we were not entirely surprised, we were all more or less disappointed over the recent order from the War Industries Board restricting the use of freight cars for the transportation of road building material.

We should not attempt to encourage or ask for a wide road building propaganda under present conditions, but we should be determined, and demand the building of such roads as will have an important bearing upon the winning of the war.

I fear that proper consideration of the relations of the highway to transportation has not been given by those in authority in Washington—not intentionally, but possibly from a lack of understanding.

In view of the fact that both the railroads and the waterways have direct representation in the National Council of Defence, I believe and would recommend that a national highway commission be added to the council so that highway improvement in its relation to winning the war may receive proper consideration.

If we had such a commission or committee that would be able to study and analyze the condition of roads in congested districts, or the development of roads to relieve the great agricultural districts, I am satisfied that their advice would be valuable to the National Council of Defence and of great benefit for highway development. I am satisfied that such a commission may be secured if everyone interested in highway development from the standpoint of public welfare will get behind the movement and use their influence for the appointment of such a commission.

To Aid in Snow Removal in New York City

The Committee on City Conditions of the Merchants' Association of New York City, has made a report concerning a plan to assist the Street Cleaning Department in snow removal during the coming winter. The plan, as outlined after conferences with the Street Cleaning Department and the Motor Truck Club of America, is as follows:

> It is proposed that immediately following a heavy snowfall, merchants agree to suspend a certain designated class of outward bound shipments during, say, one-half of the day for a period if necessary of two or three days; that during such time of suspension they release their trucking contractors from

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[*] Address at the annual "Get-Together" dinner of the American Road Builders' Association, New York, N. Y., Nov. 2, 1917.

[†] Sales Manager, Garford Motor Truck Co.

the obligation of moving freight and thereby permit such trucking contractors to place their trucks at the disposal of the Street Cleaning Department; that merchants and shippers whose packers and porters cannot be fully employed while the movement of freight is suspended assign such packers and shippers as can be spared to the duty of loading snow from the streets in the immediate vicinity of such merchants' premises upon the trucks so released.

It is believed that under this plan several hundred trucks or more could be immediately employed on snow removal on certain streets. It is proposed to ascertain what cooperation could be had among the principal wholesale grocery and dry goods houses by a personal canvass, and thereafter communicate by circular letter with the entire business community and urge the adoption of the plan.

Highway Contracts Awarded in Pennsylvania

Two contracts for road construction were awarded by the State Highway Department of Pennsylvania on Oct. 31. Both were for work in Cambria County and represented a total length of 20,948 ft. Both contracts were for vitrified block pavements, 16 ft. wide.

E. H. Brua, of Hollidaysburg, Pa., secured the contract for the improvement of 9,878 ft. on State Highway Route 52, Section 4-C, at a bid of $78,855.43. The road begins at Westley Chapel and extends through East Taylor Township.

John L. Elder of Ebensburg received the other award at $95,881.60. The proposed improvement is also on State Highway Route 52 and is designated as section 4-B, running through Jackson and East Taylor Townships for a distance of 11,070 ft.

Taxes Levied for Class A Roads in West Virginia.

The counties of West Virginia have arranged by special taxation to raise $1,841,281.68 for the purpose of constructing highways that have been designated as Class A roads. These roads receive the benefit of federal and state apportionments. The above amount represents about four times the sum required to secure federal and state aid, twenty-two of the fifty-five counties in the state having laid the maximum levy of 25 ct. on the $100 of taxable property.

The twenty-two counties referred to and the amounts raised therein are as follows: Kanawha, $226,895.61; Fayette, $96,461.51; Harrison, $90,173.26; Barbour, $43,011.80; Braxton, $37,243.78; Calhoun, $11,527.86; Clay, $16,354.18; Greenbrier, $47,851.53; Jackson, $27,394.45; Lincoln, $40,035.48; Mason, $34,907.62; Mineral, $38,562.84; Monroe, $19,381.30; Morgan, $29,467.46; Pendleton, $12,185.69; Pocahontas, $36,964.06; Ritchie, $6,661.28; Taylor, $50,590.00; Tyler, $49,175.26; Wayne, $51,633.34; Webster, $22,779.47; Wetzel, $84,095.77; Wirt, $13,369.98.

The rates of levy and amounts produced in the remaining counties, excepting Ohio County, follow: Berkeley, 10 ct., $21,815.81; Boone, 15 ct., $17,568.33; Brooke, 3 ct., $5,838.96; Cabell, 2 ct., $11,146.70; Doddridge, 10 ct., $21,169.55; Gilmer, 8 ct., $3,014.32; Grant, 15 ct., $9,800.28; Hampshire, 15 ct., $11,588.17; Hancock, 5 ct., $6,352.28; Hardy, 15 ct., $8,783.54; Jefferson, 7 ct., $11,914.38; Lewis, 20 ct., $68,153.86; Logan, 10 ct., $22,075.01; Marion, 10 ct., $68,727.20; Marshall, 2 ct., $8,986.08; Mercer, 5 ct., $11,656.83; Mingo, 1 ct., $2,605.84; Monongalia, 10 ct., $52,364.13; Nicholas, 20 ct., $31,389.62; Pleasants, 10 ct., $8,435.48; Preston, 15 ct., $37,480.78; Putnam, 12½ ct., $12,213.29; Raleigh, 5 ct., $14,790.56; Randolph, 15 ct., $34,665.83; Roane, 15 ct., $32,712.06; Summers, 20 ct., $19,195.80; Tucker, 20 ct., $25,931.42; Upshur, 5 ct., $7,601.32; Wood, 6½ ct., $32,753.09; Wyoming, 15 ct., $26,040.42.

Ohio County made no levy but will arrange, it is stated, to use a sufficient portion of the county fund for the purpose of improving Class A highways. The comparatively small rate of taxation provided in Mingo County is accounted for by the very recent passage of a $1,000,000 bond issue which rendered a heavier tax unnecessary.

The combined total funds, including federal and state aid, which will be at the disposal of the counties for the above roads during the coming year, amount to $2,291,281.68.

Continued Road Building Favored by Commissioner Babcock of Minnesota

The importance of highways in the conduct of the present war was emphasized in a recent statement by State Highway Commissioner Chas. M. Babcock of Minnesota. The growing recognition of this fact may, according to Commissioner Babcock, result in the conclusion that a federal highway board, comparable to the railway war board, is needed.

Commissioner Babcock referred to the resolutions adopted at the Atlantic City Convention of the Chamber of Commerce of the United States, in which the importance of highways was pointed out, and continuing said:

"At the beginning of the war various agencies discouraged a continuance of highway building, but now progressive men are awake to the situation. We know that foodstuffs that should go to Europe may rot on the farm for lack of adequate transportation, and that our fighting strength overseas may be seriously affected because of difficulty in getting munitions to the seaboard.

"Because of freight congestion and the possibility that it may grow worse, the war department is conducting experiments on the Dixie Highway to determine the time necessary and the cost of transporting men and supplies by auto truck from Fort McPherson to Fort Oglethorpe, compared with the same cost by rail. This is only a forerunner of the service our highways may be forced to give before the war is over."

Arkansas-Louisiana Highway to Be Built.

Construction work on the Arkansas-Louisiana Highway, one of the largest highway projects in the United States, will soon be started, according to report. The road is located in the Arkansas-Louisiana Highway District which was formed by a special act of the 1917 Legislature, and which has been upheld by the Arkansas Supreme Court.

The proposed improvement will begin at the dividing line between Jefferson and Lincoln Counties, at the terminus of the Grady Pike, and will traverse Lincoln, Drew, Desha, Ashley and Chicot Counties, ending at the Louisiana state line. A total of 178 mi. is included in the Arkansas-Louisiana Highway District, the completion of which will provide a first-class highway 225 mi. long from Little Rock to the southeastern corner of the state.

The new highway will be constructed with federal and state aid at an estimated cost of $3,500,000. The immediate flotation of bonds to the amount of $2,500,000 is contemplated, it is said, and will probably be followed by another issue of $1,000,000. It is also stated that bonds will be sold and contracts awarded in the near future.

A 2½-in. asphaltic wearing surface on a 6-in. cement concrete foundation will be put down in Chicot and Desha Counties representing the larger portion of the mileage of the road, there being 82 mi. in Chicot and 40 mi. in Desha County. The width of the road will be 14 ft. Ashley has 25 mi. of the road, while each of the counties of Lincoln and Drew have a mileage of 15, which will be constructed a water bound macadam.

A Third Convict Road Gang Will Be Employed on the Roads Near Baltimore, Md. The State Roads Commission is said to be pleased with the work of the prisoners, which it was at first thought would not be successful.

New York State Road Builders' Association

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Liberty Loan Subscriptions by the Highway Department

In the recent Liberty Loan drive the New York State Highway Department came within $500 of subscribing to $100,000 in bonds. The subscriptions were made as follows:

Commissioner's office	$5,300
Secretary's office	2,750
Auditor's office	1,650
First Deputy's office	7,900
Second Deputy's office	2,000
Third Deputy's office	5,850
Division No. 1	18,000
" " 2	8,450
" " 3	3,300
" " 4	6,500
" " 5	7,550
" " 6	7,550
" " 7	8,650
" " 8	6,200
" " 9	7,850
Grand Total	$99,500

Honor Roll of the New York State Department of Highways

The following members of the New York State Department of Highways are now in the military or naval service of the United States:

Acheson, Wm. M.
Adams, M. J.
Agnew, W. J.
Allen, C. S.
Austin, E. S.
Austin, Ward.
Backus, H. C.
Bailey, H. E.
Barnum, A. M.
Barstow, J. D.
Bassette, W. C.
Burgin, J. J.
Bermel, P. E.
Blatchley, F. S.
Booth, E. S.
Bradey, J. F. V.
Brandt, A. W.
Brennan, J. J.
Brigham, P. H.
Bruce, A. G.
Burkhart, W. F.
Burne, J. S.
Cahill, G. E.
Cameron, R. E.
Carroll, F. H.
Chamberlain, A. W.
Connors, J. J.
Cowie, J. C.
Cowlbeck, H. W.
Cramer, A. C.
Cuff, J. E.
Culloton, L. J.
Darrow, W. E.
Davis, J. G.
Davis, H. L.
Dedicke, E. C.
Diack, J. W.
Donegan, J. V.
Duggan, G. J.
Dunbar, H.
Dworsak, D.
Edwards, W. N.
Ehinger, J.
Ehrenrich, S. B.
Ettinger, J. D.
Evans, J. F.
Gardner, E. N.
Gawkins, E. T.
George, G. C.
George, C. G.
Georger, R. C.
Graham, R. B.
Grosjean, J. E.
Haley, J. E.
Hamilton, R. A.
Hathway, N. F.
Healey, W. J.
Hendricks, J. H.
Hillyard, W. J.
Hock, J. L.
Holmes, A. R.
Jahn, J. F.
Kelly, F. D.
Ketchum, L.
Kilbourn, R. T.
Klaila, H.
Leggett, E. H.
Lent, R. P.
Levy, C.
Loomis, L. J.
McEllen, C. R.
McElvaney, L. A.
McNeil, C. F.
Mackey, M. L.
Maloney, W. A.
Martin, P. H.
Mayer, F. J.
Michaels, J. R.
Miller, G. G.
Misner, F. E.
Murphy, C. E.
Murphy, D. A.
Myers, J. C.
Myers, W. R.
Nicherson, G. L.
Niles, E. C.
Noble, I. R.
Nunan, E. J.
O'Donnell, E. M.
Olmstead, C. H.
O'Reilly, J. J.
Orser, S.
Peckham, C. I.
Phalan, W. W.
Quinby, I.
Reinert, G. L.
Roberts, F. J.
Robinson, Wm.
Roche, B. V.
Rogers, L. E.
Rosenburg, S.
Rutherford, L. H.
Ryan, G. W.
Samuels, M.
Schwartz, L. H.
Seipel, C. K.
Saubert, H. C., Jr.
Shane, J. J.
Sherman, M.
Smyth, T. F.
Snow, A. M.
Sperry, L. M.
Stahl, J. J.
Stickney, H. H.
Streeter, H. G.
Suprenant, F. K.
Sweet, G. V.
Tallmadge, J. G.
TenHagen, H.
Terry, F.
Thomas, J. H.
Thompson, A. H., Jr.
Thornton, D. R.
Treadwell, W. A.
Turgeon, J. E.
Violante, A. L.
Wentworth, H. G.
White, J. B.
Whitney, L. H. M.
Wright, H. B.

Crusher Run

Wm. P. McDonald is up from Florida on sick leave after finishing up more than 30 mi. of his 42-mi. contract.

A. D. Bridges' Sons of Hazardville, Conn., who have done considerable road work in New York State, have just been awarded a 5-mi. contract in Maine.

The Court of Appeals has decided that Peter F. Connolly of Elmira, N. Y., is fully entitled to $29,000, which he was awarded by the Court of Claims last winter in his action against the State Highway Department.

Following a decision handed down by the district appellate board, nine state and city employees who have been accepted for the draft army and who claimed exemption on the ground of dependents will have to do their bit in the army. The board rules that their dependents will be supported by their salaries, which will continue.

(Continued on page 252)

Massachusetts Highway Association

Founded 1893

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JOHN A. GAFFEY, Medford

Announcement

This section of the paper is open to members of the Massachusetts Highway Association for the discussion of matters directly connected with road interests. Members are requested to submit items of interest for use in this column.

Address all communications to GOOD ROADS, P. O. Box 2613, Boston.

A meeting of the Board of Governors of the M. H. A. was held at the rooms of the Massachusetts Highway Commission on Oct. 18. Very little of importance was accomplished and it was voted to meet again on Oct. 22 at the Boston City Club to discuss the matter of an official bulletin for the association, and decide on the details for the time and place for the next regular quarterly meeting.

Present—Messrs. Williams, Jones, Spates, Gaffey, Brown and Secretary McCarthy.

The adjourned meeting of the Board of Governors was held at the Boston City Club on Oct. 22, and several guests were invited to be present by the board.

The question of an official bulletin for the M. H. A. was discussed on account of the consolidation of "The Highway Contractor and Road Builder" with "Good Roads." It was unanimously voted to continue the official notes of the association in "Good Roads" in place of "The Highway Contractor and Road Builder," which discontinues publication.

A committee of three was appointed by the chair to present a favorable report to the next meeting on advisability of amending the by-laws of the M. H. A. to include a subscription to the publication that may from time to time be selected by the members as the official bulletin of the association. Members of this committee: Messrs. Jones, Spates and Gaffey.

The chair also appointed a committee to draw up and present at the next meeting such amendment as will be necessary to permit of the changes in the by-laws suggested above. Members of this committee: Messrs. Keyes, McCarthy, Price.

The question of holding the next quarterly meeting of the association at Camp Devens was favorably acted upon and the chair appointed a committee to have full charge of the arrangements. Members of this committee: Williams, Ellis, Keyes, Gaffey, Rhodes, Pond and McCarthy.

The regular quarterly meeting of the M. H. A. was held at Camp Devens, Ayer, Mass., on Nov. 1. The members assembled at the Central Restaurant at 12:30 p.m., and dinner was served at 1:00 p.m.

When the dinner was over, it was decided to defer any discussion of business and on motion of Mr. Rowe, it was voted to hold a meeting in Boston during the early part of December to settle the unfinished association business now pending.

When the meeting adjourned, the party drove over the entire cantonment.

The members were much interested in what they saw and the war has been brought closer to many who had never seen the camp before.

The attendance was beyond expectation, and the dinner was served to 303 members and guests.

Street Work in Springfield

A review of the street work accomplished during the past four years by the Department of Streets and Engineering, Springfield, Mass., may be of interest in view of the recent reelection of the Superintendent, Fred H. Clark, for a second 5-year term. Mr. Clark took charge in January, 1913, of the then recently consolidated Departments of Engineering, Streets, Sewers, Forestry, Street Lighting and Garbage, Ashes and Rubbish Collection.

FREDERICK H. CLARK,
Superintendent of Streets and Engineering, Springfield, Mass.

The comparatively large amount of paving laid is accounted for by the fact that this 4-year period followed a long period of inadequate appropriations for street work, during which automobile traffic increased to about 82% of the total vehicle traffic in this rapidly growing city.

Mr. Clark has laid 308,000 sq. yds. of permanent pavement in Springfield, which is 65% of the total yardage. He classifies as permanent pavements those with a concrete base.

Wood block seems to have been used more extensively than any other type of permanent pavement. The main street of the city, two important thoroughfares, and several minor heavy traffic streets in the downtown district are paved with it. At one point in Main St. it sustains the most concentrated traffic in the city, averaging 8,731 vehicles per 14-hour day, according to the department's 1917 traffic census. About 50% of the yardage of wood block pavement was laid during the 1913-1916 period.

Only 15% of the brick pavement has been laid during this period, and only on hills and special street intersections. Practically all of the balance is Syracuse brick, some of which has been in service since 1893.

The cement concrete type of pavement was introduced in Springfield by Mr. Clark to the extent of 107,519 sq. yd., including 46,066 sq. yd. of Hassam concrete.

One of the concrete roads is 3½ mi. long, and on the main route between Springfield and Boston, and is paved 22 ft. wide to the city boundary, connecting there with the state's concrete road. This road is a motorist's paradise and has no superior, it is claimed. The average daily traffic amounts to 2,000 vehicles, 96% of which are motor-driven. An interesting point in connection with these concrete pavements is that they were constructed 2 in. below the established grade to allow for a future asphalt top.

Ninety-four per cent. of the granite block permanent pavement has been laid on hills too steep for the smoother pavements, and in the wholesale and railroad districts where horse-drawn vehicles are still numerous, although constituting only 27% of the total volume of traffic.

Springfield has an area of 102,535 sq. yd. of the various types of asphalt pavement, of which 84% was laid during the first four years of Superintendent Clark's administration. This type of pavement has in the past been selected for minor streets in the mercantile district, for secondary thoroughfares in residential districts and for streets with street car tracks. Each of these classes of street sustains comparatively heavy traffic or, as in the case of streets with street car tracks, a greatly concentrated traffic, and the general policy is to pave permanently and mostly with grit asphalt, a product of the city's asphalt plant, the streets with street car tracks.

Mr. Clark's record in the matter of new pavements shows that he reconstructed 716,800 sq. yd. or 41% of the total area of Springfield's highways during the four years, 1913 to 1916. In spite of this there are 934,200 sq. yd. of water bound macadam still in service. This type of pavement is gradually being converted into either, depending on traffic conditions, tar top or bituminous concrete pavements, the latter another plant product. The amounts of tar top and bituminous concrete pavements laid are 119,462 and 126,412 sq. yd., respectively.

Bituminous macadam is the type of pavement which has been laid most extensively. This surface is used in minor residential streets, where it has to sustain only light traffic and where its freedom from dust is valuable.

Glutrin-bound macadam, with an area of 5,329 sq. yd. is another type of pavement which has been tried, and it is used on a country road having a considerable volume of motor traffic.

Thirteen per cent. of the total yardage of granite block pavement has been laid on sand. This pavement was laid as a temporary expedient for a street in the railroad district which will be widened in the near future.

Rocmac has been used on the steep section of an important residential street as an experiment.

It may be interesting to note that the department maintains about 50 mi. of country gravel roads. These roads are kept in excellent shape by a system of patrols, in spite of heav motor traffic.

The name, Department of Streets and Engineering, is misleading in that it does not adequately describe the scope of the work which Mr. Clark supervises. The department might more properly be called the Public Works Department, and probably would have been so called at the time of the reorganization, if the city had not already had a Board of Public Works, an advisory body.

As city engineer, he has made over, and with practically no changes of personnel, the old engineering department, by rearranging the work, by added responsibility, by greatly increasing previous meager salaries, and by other means, so that he has now a really cooperative organization. In 1915, recognizing the department's lack of data necessary for comprehensive sewer and city planning studies, he added about ten men to the force to make a topographical map of the entire city. He also revised the former policy of employing outside engineers to design the department's structures. Three bridges have been designed and built under his supervision, also, the rubbish incinerator, the aphalt plant, a stable, the wayfarers' lodge, the department shop, and other smaller structures, most of which were built by day labor. He has now plans in preparation for a bridge carrying an 82-ft. avenue over the main line of the Boston & Albany Railroad.

Although to date the sewer division has done mostly routine and extension work, plans are in preparation for considerable work designed to relieve several of the city's trunk sewers.

The street lighting system has been entirely changed over during this period, and to the city's advantage, both in effect and financially.

The service rendered the city by the collection of household wastes is unusual. In Springfield the collection is made from the basements and the empty receptacles returned to their storage place. This service, although costly, is certainly valuable as it relieves householders of this heavy, disagreeable work and obviates the necessity of decorating the sidewalks with ash, rubbish and garbage containers.

Mr. Clark has provided his department with an unusually complete equipment of yards, shops, asphalt plant, laboratory, garage, stables, wagons, trucks, road oil trucks, flushers and all types of modern labor saving devices.

Under Superintendent Clark's administration Springfield has become a popular place for visiting town and city officials who wish an opportunity to see how annual appropriations of over $1,000,000 can be expended without politics, without graft and without waste, and if there ever was a city that has received full value for its public works expenditures it is Springfield, during the past five years; and it is to the great credit of the citizens that an honest and efficient official has been appreciated sufficiently to be retained in office for another 5-year term.

Chief Engineer Dean of the Massachusetts Highway Commission attended the annual election and banquet of the American Road Builders in New York on November 2. He was the retiring president of the association.

Commissioner Murphy of the Public Works Department of Boston has read the riot act to some two score Street Department inspectors. The commissioner warned them that the work of locating depressions and defects in street surfaces and having them repaired promptly was the most important part of their duties, and unless properly attended to they would lose their positions.

To Jan. 1, 1914, the cost of restoring the Bullfinch front of the State House, new land taken, and park on east side amounted to $7,173,663. Additional appropriations for the two wings and land takings on the west side amount to $2,265,000.

Government by a town manager has been for some time one of the principal topics of conversation among the citizens of Winchester, and recently a meeting was held in the town hall to consider the advisability of the change. The question was debated by a number of the town solons with a view to giving the voters an opportunity to hear the merits of both sides. The honors for the evening were about evenly divided, and the momentous question still hangs in the balance.

A recent decision of the full bench of the Massachusetts Supreme Court will interest all members who own automobiles. In 1911, a Mrs. F. invited a Miss M. to take a pleasure ride in her automobile, and on the trip the machine struck a telegraph pole in Newton, and Miss M. was seriously injured. Miss M. later brought suit for personal injuries against Mrs. F., and was awarded $1,225 damages by a jury. Judge Dana of the Superior Court set this verdict aside and the case was carried to the Supreme Court, and the final decision resulted in upholding Judge Dana's decision in favor of the defendant. The opinion was written by Judge Loring and cites English, French and United States decisions to the effect that as the service rendered was gratuitous, no claim for damages could prevail.

Henry A. Spates, Superintendent of Streets of Milton, reports that this is the only season in his long experience as a road builder that labor conditions and shortage of materials prevented the completion of necessary highway work. Two young men from the Milton Highway Department have gone to war and practically all of the other employees are beyond the age limit.

The North Shore Street Superintendents' Club held a meeting in Chelsea at the City Hall, on Friday, Oct. 19, 1917.

Guy H. Chase of the Engineering and Street Department of Fitchburg has resigned. David A. Hartwell, former Chief Engineer of the Sewerage Disposal Commission, is mentioned as being the mayor's choice for the vacant office. The question of establishing a public works board in the city will be decided at the next municipal election.

The Civil Service Commission has finally approved an appointment for Superintendent of Supplies of Boston.

Mayor Curley has sent in a number of names, but none of the applicants has been satisfactory to the commission.

The successful candidate for the position is Thomas H. Dawson of 626 Saratoga St., East Boston, and has for thirteen years been employed in the purchasing department of the Boston Elevated Railway Co. The position pays $3,000 per year.

A bridge to connect Neponset with Squantum, the site of the new ship building industry of the Fore River Co., has been advanced by the Dorchester Board of Trade, members of which appealed to Mayor Curley today, asking him to use his influence at Washington.

The Government will be asked to furnish the $350,000 estimated for construction, the move being made in anticipation of convenience to thousands of workmen who will be employed when the construction of the plant begins. It is proposed to have the foot of the bridge at Mill St.

Arthur W. Woodward, Deputy Superintendent of Streets and Engineering of Springfield, Mass., has just returned from an extended hunting trip in northern New Hampshire. Arthur does love to hunt and fish, and we understand he usually brings home some tangible results of his skill as a sportsman.

Out in Waltham, Superintendent of Streets Jones, has just completed a resurfacing job on Moody St. from Hall's Corner to the bridge. The granite blocks laid about twenty-five years ago were considerably worn and irregular, and about 4 in. below the present grade. The necessary depth of crushed stone was spread over the blocks and two applications of asphalt amounting to 3 gal. per sq. yd. were applied by the penetration method. The result is very satisfactory.

The town has been stirred up for some time by a few citizens who advocate a change in the charter to provide for the adoption of the town manager form of government. Many of the leading townsmen are strongly opposed to the change. The matter will be decided by the votes at the next election.

General fall cleaning of all town highways will start next week.

The following M. H. A. members attended the annual dinner and meeting of the American Road Builders' Association in New York, on Nov. 2: Messrs. Dean, Pillsbury, Ellis, Moulton and Weedon.

The members of the Massachusetts Highway Association who have read the letters previously printed in this column from Joseph Keyes, son of John M. Keyes of Concord, will be interested in the following letter in which Joe describes the receipt of the Croix de Guerre which was awarded him for bravery:

G——, Sept. 4, 1917.

Dear Mother:

Just a few minutes to spare so will try and tell you the latest. The ceremony of presenting the Croix de Guerre took place two days ago, and I was more nervous than when under shell fire. The rest of the fellows were lined up and then we were called out and stood facing them. Back of us were two squads of poilus who stood at present arms. Then the general came in and after reading the citations stepped up to us and pinned the Croix de Guerre on. He then thanked us in the name of France and all his staff did the same. I was scared stiff. Thought sure I was going to get kissed. I tell you I was sure tickled. There were about twenty pictures taken of the ceremony, and one at least should turn out good. Would send you the citation but don't want to take a chance on losing it so here is a copy of it:

Translation of Citation.

2nd Army,
31st Army Corps,
Department of Sanitary Service, S. P. 46

Keyes, Joseph, American Driver (EV) Order No. 23 of the American Sanitary Section No. 16. A driver of great courage and fine spirit. Distinguished himself particularly on the 19th, 20th and 21st of August, 1917, when without thinking of the gun fire, at times very violent, he did hard and laborious work during day and night in the evacuation of the wounded giving thus his comrades the best example of duty, nerve, and presence of mind at Q. G. S. P. 46, August 29th. The Surgeon in Chief du Bourgeut, of the 1st Class, Director of the Sanitary Service of the 31st C. A.

As for experiences, well, I have had so many close calls that I don't dare write about them. The American troops are going to take over this section soon so I hope to see Joe Murray before I leave. It will take two months, at least, before we are taken over, so will have a chance to finish out my nine months with the French army, and then I am certainly coming home if I have to swim.

Just to give an example of the strain we have been under, will take the last two days. Went out to B— on post and dodged shells all the way out, then made five trips in under shell fire. When I at last got back here for a quiet night the Boches sent over some planes and we dodged bombs most of the night. Today is one of those Indian summer days that we get in November at home. Have got to go on call, so must close. Love to all. JOE.

New Hampshire Good Roads Association

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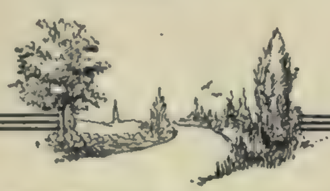
E. H. Wason, Nashua, N. H.
A. A. Wallace, Keene, N. H.



Lieutenant Philip Stevens Day, now stationed at Fort McKinley, Maine, was formerly employed by the State Highway Department.

Alfred E. White has been drafted. It is a great loss to the State Highway Department, as he is an expert on modified asphalt construction work.

City Engineer Winslow, of Nashua, attended the annual meeting of the American Road Builders' Association in New York City on November 2.

On Federal Aid Project No. 6 from Bradford to Newbury the work has begun, and Federal Aid Project No. 7 from Danbury to Grafton is ready for construction.

The town of Lyme has installed a crusher plant about ½ mi. north of Lyme Village to crush trap rock which will be placed on the West Side Road in the village of Lyme.

The State Highway Department has purchased a crusher and set it up in Dixville Notch with the expectation of crushing trap rock to be placed on the East Side Road in Colebrook.

The town of Haverhill has completed 4,100 ft. of gravel road on the so-called Moosilaukee Road.

The traveling public will be pleased to know that the Moosilaukee Road in Benton Flat, so-called, has been built.

The New Hampshire Good Roads Association received an invitation from the Board of Government of the Massachusetts Highway Association to join them in a trip to the Ayer cantonment on November 1, and a party attended, going over the road in automobiles.

The town of Newport has completed 5,000 ft. of gravel road on the Central Trunk Line between Newport and Claremont. The town of Claremont has also completed 7,000 ft. of gravel road at the Newport line, most of which has a telford base. These sections were particularly muddy in the spring of the year.

The Highway Department has lost three of its younger men in the recent draft. Harold V. Clarke, of Dover, was drafted and is now at Camp Devens; Richard W. Brown enlisted in the Vehicle Department of the Field Artillery of the 103d Regiment, and Leroy F. Johnson enlisted in the 101st Regiment, U. S. Engineers.

Crusher Run

(Continued from page 248)

S. B. Van Wagenen turned in an estimate of almost $23,000 on a repair contract this month.

New York State is to receive federal aid for its road building to the extent of $749,674.20 during the fiscal year ending June 30, 1919.

Beavers in Jenkins Brook have constructed a dam which has raised the level of their artifical lake so high that the new state road under construction from Moody in Hamilton County to Long Lake, forming a link in the trunk route from Franklin County to Saratoga, is in danger of inundation, says the "Adirondack Enterprise." The beavers, which are on private property and are protected by the state, have built up the dam 7 in. in five weeks. The problem is proving a hard one for Theron M. Ripley, Division Engineer.

Construction and repair of state highways throughout the state will be discontinued within the next few days, according to an announcement by Edwin Duffey, State Commissioner of Highways, following a conference with Governor Whitman. This action will affect more than 300 highway contracts and is the result of the action of the federal government in prohibiting the use of flat cars and open cars on railroads for the transportation of sand and other materials used for highway construction. The cars are being taken over for the movement of coal.

Contract for the Antwerp-Carthage Road Cancelled

The New York State Highway Department has cancelled the contract with P. J. Kennedy for the construction of the Antwerp-Carthage Road. Temporary repairs will be made to the highway in and near Antwerp by Division Engineer Theron M. Ripley to make it passable during the winter, and new bids will be asked.

Contractor Kennedy has been working on the road for more than a year, but has not completed it. In the village of Antwerp some 150 ft. remain to receive the concrete foundation before brick can be put down. The local division will undertake this work and will also make the road passable outside of the village.

The State Highway Department has issued an order in connection with the cancellation of the contract announcing that the contractor and his surety, the National Surety Company, will be held liable for any additional cost above the contract price.

MEETINGS

Calendar of Coming Meetings

Nov. 19-20.—National Paving Brick Manufacturers' Association.—Annual meeting, Cleveland, Ohio. Secretary, Will P. Blair, 830 Engineers Building, Cleveland, Ohio.

Nov. 19-24.—City Managers' Association.—Annual meeting, Detroit, Mich. Secretary, W. L. Miller, City Manager, St. Augustine, Fla.

Nov. 21-24.—National Municipal League.—Twenty-third annual meeting, Hotel Statler, Detroit, Mich. Secretary, Clinton R. Woodruff, 703 North American Building, Philadelphia, Pa.

Dec. 4-6.—American Association of State Highway Officials.—Annual meeting, Hotel Jefferson, Richmond, Va. Acting Secretary, H. M. Berry, Chapel Hill, N. C.

Jan. 15-17, 1918.—Virginia Good Roads Association.—Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

American Road Builders' Association

The annual meeting of the American Road Builders' Association was held at the Automobile Club of America, New York, N. Y., Friday, November 2. The association meeting was preceded by a meeting of the board of directors at 2 p.m., and followed by the annual "Get-Together" dinner, also at the Automobile Club, at 6:30 p.m.

The principal business of the meeting was the election of officers. Routine business was also transacted and several matters of interest to the membership were discussed. Among these were the restrictions on open top freight cars for the shipment of road materials, and the matter of the 1918 convention. The election of officers resulted as follows:

President, H. E. Breed, First Deputy Commissioner, New York State Commission of Highways; First Vice President, Lieut.-Col. W. W. Crosby, Consulting Engineer, Baltimore, Md.; Second Vice President, Austin B. Fletcher, State Highway Engineer of California; Third Vice President, Arthur H. Blanchard, Professor of Highway Engineering, Columbia University; Secretary, E. L. Powers, Editor of "Good Roads"; Treasurer, E. L. Powers, Editor of "Good Roads."

Directors for three years: Maj. H. L. Bowlby, Senior Highway Engineer, Office of Public Roads and Rural Engineering, U. S. Department of Agriculture; William H. Connell, Engineering Executive, Day & Zimmerman, Philadelphia, Pa.; Joseph W. Hunter, First Deputy Commissioner, Pennsylvania State Highway Department; Nelson P. Lewis, Chief Engineer, Board of Estimate and Apportionment, New York, N. Y.; H. G. Shirley, Chief Engineer, Maryland State Roads Commission; William R. Smith, President, Lane Construction Corporation, Meriden, Conn.

A. W. Dean, the retiring president, acted as toastmaster at the dinner, and, after expressing his thanks for the cooperation he had had during the past year, introduced as the first speaker, H. E. Breed, the new president.

Mr. Breed spoke very briefly, thanking the organization for his election. He said that never before had the opportunities of road builders been so great as they are today, and emphasized the necessity of cooperation.

The next speaker was S. M. Williams, Sales Manager of the Garford Motor Truck Co. Mr. Williams' address is printed elsewhere in this issue.

State Highway Commissioner Edwin Duffey followed Mr. Williams. Much of his address was devoted to a description of the difficulties encountered by the department and by the contractors during the past year. He said that out of 350 contracts in existence in the state, only between 60 and 70 had resulted in disaster or complete stoppage, in spite of the serious troubles encountered in securing labor and material. He said that upwards of 400 mi. of road had been completed and accepted during the year and complimented the contractors upon their work. Commissioner Duffey also spoke of the loss of men who had joined the colors, stating that between 200 and 300 men from the department had volunteered for service or had been taken by the draft.

G. E. Blakeslee, Member of the New Jersey Highway Commission, was the next speaker. Mr. Blakeslee's address consisted largely of a description of the present situation in New Jersey, and a history of the legislative action leading up to the passage of the present law under which work is carried on.

At this point, Mr. Dean read an extract from a letter received from F. D. Underwood, President of the Erie Railroad, in reply to an invitation to be present at the dinner and address the association. The extract follows:

> When one sees the wonders that have been done in road building in the past ten years there is real food for congratulation. We have all blundered and temporized with the road question. The real savior—so far as abstract saviors can save—is the development of the motor truck. That feature puts the expenditures for good roads on an essential basis, and frees all of us who have been clamorous for good roads, from the ban of "good roads for pleasure only." Those who came to scoff at good roads some years ago remained to pray, and long prayers they are.

Maj. I. C. Moller, of the 23d Engineers, spoke briefly describing the organization of his regiment and the work it is expected to do. The regiment will consist of about 10,500 men and officers, and will perform all of the road work back of the American front in France. He said that the regiment now included men from every state in the Union, from Alaska and the District of Columbia, men from every state highway department in the country, and men from every engineering school. The present need of the regiment, according to Maj. Moller, is roller and crusher operators and men skilled in similar work.

Leo Pasvolsky, Editor of "Russkoye Slovo," followed Maj. Moller. Mr. Pasvolsky described briefly the present economic and military conditions in Russia and expressed the belief that the Government and army would be reorganized and that Russia would again be a large factor in the war.

At the conclusion of Mr. Pasvolsky's remarks, Mr. Dean relinquished the chair to President Breed and the meeting adjourned.

Illinois Highway Improvement Association

The sixth annual convention of the Illinois Highway Improvement Association was held at Bloomington, Oct. 24. The delegates outlined a campaign in the interest of the proposed $60,000,000 state road bond issue. An address by Governor Lowden, in which he urged the approval of the bond issue, was a feature of the convention.

W. G. Edens of Chicago, was elected President; Richard J. Finnegan, Chicago, Vice President; R. W. Dunn, Chicago, Secretary; Thomas Suddeth, Springfield, Treasurer.

National Conference for Better Government

The twenty-fifth national conference in the interest of good government will be held in Detroit, Mich., Nov. 19-23. The City Managers' Association, the National Municipal League, Municipal Research Conference and other civic organizations will participate in the convention.

At the next regular monthly meeting of the Motor Truck Club of America, the guest of honor and principal speaker will be Magistrate Frederick B. House, of the Traffic Court of New York City. The meeting will be held at the Automobile Club of America on Wednesday evening, Nov. 21, and will be preceded by a dinner at 6.30 p. m.

The Star Highway Association will hold its first annual convention at Woodward, Okla., on Thursday and Friday, Nov. 15 and 16. The purpose of this association is to promote the improvement of a highway beginning at Fort Worth, Texas, passing through the State of Oklahoma, and terminating at Dodge City, Kan., in an intersection with the Santa Fe Trail. Officers and members of the highway departments of the three states named above have been invited to take part in the convention.

The Hamilton-Guelph-Owen Sound Good Roads Association was formed at Guelph, Ontario, on Oct. 15, at a meeting of five hundred delegates from Owen Sound, Hamilton and intermediate points. The purpose of the organization is to promote the construction of a highway between Hamilton and Owen Sound. Officers were elected as follows: President, G. B. Ryan, Guelph; First Vice President, Wm. Gaskill, Hamilton; Second Vice President, C. F. McGregor, Fergus; Secretary-Treasurer, T. J. Hannigan, Guelph.

A good roads meeting attended by several thousand interested persons was held at Chillicothe, Mo., on Oct. 17, in conjunction with the Northwest Missouri Farm Congress. The formulation of plans for the improvement of main highways, with especial reference to a cross-state road from Hannibal to St. Joseph, and a north and south route from Kansas City to St. Louis, was the purpose of the meeting. E. L. Sanford, Chairman of the State Highway Board, and other members of the State Highway Department, including State Highway Engineer Alexander W. Graham, addressed the convention.

PERSONAL NOTES

J. F. Mangold, City Engineer of Grinnell, Ia., and Assistant Professor of Engineering at Grinnell College, has accepted the position of Professor of Civil Engineering in the State School of Mines, Rapid City, South Dakota.

George H. Tefft, Secretary of the International Clay Products Co., and director of the Clay Products Exposition held in connection with the annual meeting of the National Brick Manufacturers' Association, has been made Secretary and General Manager of the newly organized Clay Products Association, with headquarters in the Chamber of Commerce Building, Chicago, Ill.

Clifford Older, who has been Acting Chief Highway Engineer of Illinois since the death of William W. Marr, has been appointed Chief Highway Engineer by Governor Lowden. Mr. Older was Bridge Engineer of the former State Highway Commission and retained that position after the work of the commission was placed under the direction of the Department of Public Works and Buildings this year.

Chas. A. Clark, Assistant Superintending Engineer of bond issue roads in Vermilion County, Illinois, has resigned to accept a position with the the Kansas City, Mo., division of the Portland Cement Association. His office is in the Rialto Building, Kansas City.

T. B. Shertzer, who was formerly an asisstant engineer of the Bureau of Highways, Philadelphia, Pa., and recently City Manager of Portsmouth, Va., has been made Eastern District Engineer of the Hydrated Lime Bureau, of Pittsburgh, Pa., with headquarters at New York City.

PUBLICATIONS

CITY OF PORTLAND, MAINE. ANNUAL REPORT OF THE COMMISSIONER OF PUBLIC WORKS, 1916. Paper, 6x9 in., 60 pp. and covers; illustrated.

This report of the operations of the Department of Public Works for the year ending Dec. 31, 1916, is composed chiefly of statistical data relating to maintenance and construction work on streets, sidewalks and bridges in Portland, with the details of appropriation and expenditure. Statements of the following are presented: Street contracts, street supplies, stable supplies, new streets, street monuments, permanent paving, cost and maintenance data on state highways, cost and amounts of pavement laid during 1916, distribution by streets of new sidewalks and gutters constructed during the year, cost details and bridges. Work relating to sewers is also reviewed in the report. A number of excellent half-tone illustrations showing improved and unimproved streets and highways accompany the text.

"THE EXPANSION AND CONTRACTION OF CONCRETE AND CONCRETE ROADS," by A. T. Goldbeck, Engineer of Tests, and F. H. Jackson, Jr., Assistant Testing Engineer, Office of Public Roads and Rural Engineering, U. S. Department of Agriculture. Bulletin No. 532, U. S. Department of Agriculture. Paper, 6x9 in., 31 pp. and covers; illustrated, insets. Price 10 ct.

Contained in this volume are laboratory measurements of expansion and contraction of concrete, and the results of such measurements, methods of measuring the expansion and contraction of concrete roads, results of tests at Chevy Chase, Md., on six sections of different varieties, and the expansion and contraction of the Ohio Post Road, the measurements being taken over three 300-ft. experimental sections of this concrete road. The concluding chapters of the bulletin contain a general discussion of the expansion and contraction of concrete pavements, and conclusions based on expansion and contraction of measurements. Each division of the text is illustrated by diagrams, some of which are insets. One half-tone illustration of the measuring instrument used on the Chevy Chase Road is also shown.

ALABAMA STATE HIGHWAY COMMISSION. Sixth annual report from April 1, 1916, to April 1, 1917. Bulletin No. 14 of the State Highway Commission. Paper, 6x9 in., 46 pp. and covers; illustrated, insets.

Following a resume of the work of the Alabama State Highway Commission for the year ending April 1, 1917, there are presented in this annual report a complete financial statement giving expenditures by state and counties for various classes of roads, and the number of miles of road constructed in the state during the year. The report also contains a statement of amounts appropriated and paid to counties out of the state highway fund for the year ending April 1, 1917, and a review of state aid work in each county of the state. A chapter on the maintenance and repair of public highways, including macadam, chert, gravel, sand-clay and graded earth roads, and another on highway bridges, are contained in the report. The half-tone illustrations show views of bridges in Barbour County under flood conditions and other road and bridge scenes. A table of unit prices and a statement of state aid road mileage and expenditure, of county mileage and expenditure, and of total road mileage are given in the insets.

GOOD ROADS

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WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LII.
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NEW YORK, NOVEMBER 17, 1917

Number 20

The Cracking and Buckling of Cement Concrete Pavements

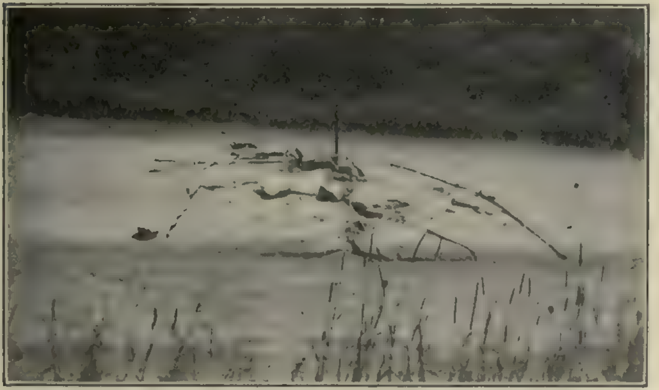
By H. T. TUTHILL.*

During the past two years the writer has been in a position to observe closely the construction and maintenance of cement concrete pavements, and it is in the interest of the future development of this type that these data and the accompanying illustrations are presented.

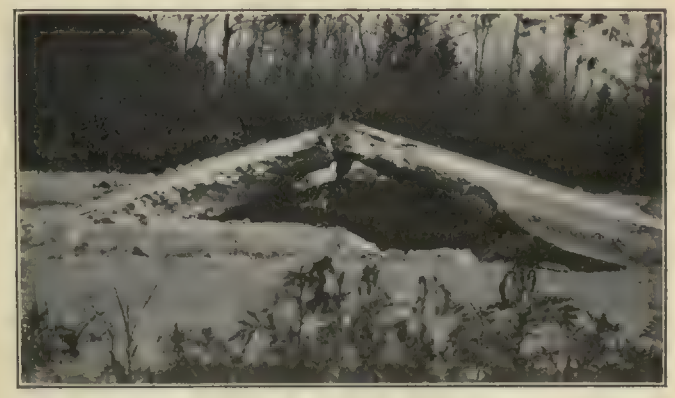
Most road builders know the good qualities of first-class cement concrete pavement if they have had anything to do with its maintenance. On the other hand, all may not be so familiar with the effects of different aggregates on the wearing qualities of pavements of this type.

The data presented here cover three concrete paved roads —the Huntington-Amityville Road, extending northerly 4.69 mi. from the north corporation line of the village of Amityville; the Blue Point-Moriches Road, 12.89 mi. long, and the road between Bayshore and Bluepoint, 12.86 mi. in length. All of these were paved with 1:1½:3 concrete and were provided with transverse expansion joints 30 ft. apart. The joint used consisted of a ⅜-in. strip of creosoted yellow pine. The shoulders in all cases were of a sandy loam.

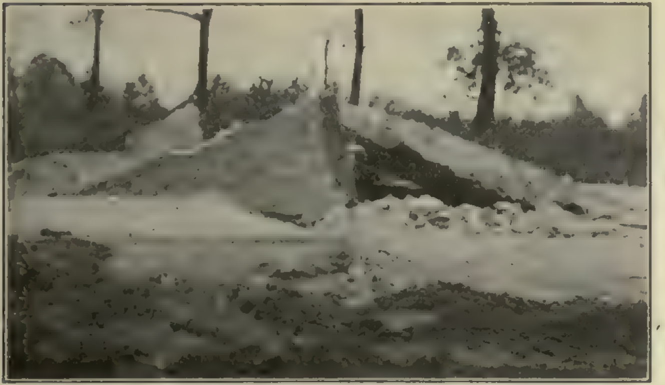
The pavement on the Huntington-Amityville Road is 16 ft. wide, with a 7-ft. earth shoulder and a gutter 1 ft. wide



A Section of Pavement 14 Ft. Long and 16 Ft. Wide Broken Into Twelve Pieces.



Another Break Where 14½ Lin. Ft. of 16-Ft. Pavement Heaved and Broke.



This Section "Blew Up" Suddenly with a Loud Report, Scattering Dust and Fragments of Concrete in All Directions.

View Looking Along the Center Line of the Road Toward the Break Shown in the Illustration at the Left.

CRACKED AND BUCKLED CEMENT CONCRETE PAVEMENTS.

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*County Assistant Engineer, Suffolk County, New York State Commission of Highways.

on either side. As built, the shoulder midway between the outside of the pavement and the inner edge of the gutter was 6 in. below the grade of the pavement at the center, while the bottom of the gutter was 12 in. lower, or 18 in. below the theoretical grade. The concrete was laid to a finished thickness of 7 in. at the center and 5 in. at the sides, the outer edges being beveled 3 in. down and 3 in. back. The aggregate used was native bank gravel.

The Blue Point-Moriches Road and the road between Bayshore and Blue Point are similar in construction to the Huntington-Amityville Road except that the ditches are shallower—from 9 to 12 in. below the grade of the pavement at the center—and on some parts imported crushed stone was used for coarse aggregate. On the Bayshore and Blue Point Road, there is a section about 2 mi. long, from Oakdale through Sayville, where a coarse aggregate of native gravel was used, while a crushed stone aggregate was used on the rest of the road. On the easterly section of the Blue Point-Moriches Road native gravel was used as the coarse aggregate; on the remainder crushed stone was used.

The writer has noted that in the case of the pavement built with the coarse aggregate of imported crushed stone, there has been no buckling or heaving of the slabs. The pavement developed cracks, but the number of them as compared with the number in the gravel concrete was less, as was also the width of the cracks. No buckling occurred in the pavement built with the deep ditch section, in which the coarse aggregate was gravel. There were numerous cracks, however, running in every direction, those occurring longitudinally of the pavement opening very wide.

On the shallow ditch section of the gravel concrete pavement, bad cases of buckling, considerable distances apart, occurred within a week during an extremely hot spell. Longitudinal cracks were also more or less frequent on this section, but there were few diagonal cracks.

The writer has observed no buckling or oblique cracks on the pavement through the village of Sayville where the pavement extends from curb to curb. Longitudinal cracks are not frequent and, where they do occur, are not wide.

On the Quogue-Southampton Road, now under construction, extra wide expansion joints are being put in 1,000 ft. apart. These are in addition to the usual joints at 30-ft. intervals, and are expected to take care of extraordinary expansion in the pavement. They are 2 in. wide and are filled with sand and bituminous material.

Methods of Concrete Road Construction in Wood County, West Virginia[*]

By **BURDETTE WOODYARD**[†]

Under the plan of road building adopted by Wood County, it has been found that all interests are best served by doing the work on force account. In general, it may be said that where there is a great amount of work to be done at any one time the contract method may be the better, but where a county is doing a certain amount of work each year, with funds provided as they are needed, force account can be used to good advantage. It may also be said that the success or failure of force account depends a great deal upon the man in charge of the work. There are many good engineers who are able to obtain excellent results with the contract system, but who are lacking in the executive ability needed under the force account plan. Also, there are many men who, from an extended business career are provided with ability to organize and execute, but have not the knowledge of road matters and construction to make a success of the undertaking.

The man in charge must be first of all an executive of ability, able to organize, capable of handling men to good advantage, and a thorough student of road construction. If he is an engineer so much the better. If he is not, he must have associated with him an engineer with whom he is able to advise and, if necessary, must modify his plans that entire practicability may be maintained.

It is readily to be seen how important is the ability of the man who undertakes to carry on county road work by force account, and while it must be admitted that there are counties whose success with force account has been so remarkable as to attract attention throughout the country, it must also be admitted that these are the exceptions rather than the rule and the adoption of the force account system is subject to serious limitation. One of the outstanding features of the force account system, as it applies to work in Wood County, is its entire flexibility. The work for any year may be laid out and started at any place and at any time, and may thus be carried on with a maximum regard for the convenience of existing traffic. If for any reason, a slight modification of the plans is deemed advisable this may be made without precipitating a dispute or a troublesome adjustment of charges. The county wishing to experiment to determine what is best in any project may carry on such trials either as to methods or materials as may seem advisable. The grading for any proposed hard surfacing may be done in the fall of the year, allowing the work to settle during the winter and thus be in excellent shape for receiving the surface.

Wood County has developed a comprehensive plan for the improvement of its roads and to insure the provision of funds as they are needed for a term of years. It has thus been possible to develop and maintain a highly efficient organization of thoroughly trained men who are always available and who have learned to acquire more than a passing interest in the quality of the work.

An organization of this kind need not be broken up at the end of the construction season, for when the county has an investment of a considerable sum in machinery and equipment it must be kept in good order and repair. During every winter, Wood County's entire plant is gone over and put in first-class operating condition for the next season's run.

It is entirely possible to maintain a plant during the winter where concrete culvert pipe can be manufactured for use on the road. If this plant is set up in a warm building with provision for steam curing, an excellent product can be manufactured during the winter. This will be found an exceedingly wise and profitable investment of county funds.

One difficulty in the way of the efficient prosecution of force account work is the practice of false economy on the part of the county officials. While a contractor will provide himself with every labor saving device and the best machinery he can buy, a county is likely to be too conservative in appropriating funds for the purchase of necessary equipment. Wood County has learned from experience that the best equipment that can be had is the cheapest in the long run.

Force account need not be considered as competing with contracting. There are many places where conditions favorable to one method are unfavorable to the other. A wise choice can be made only after a careful study and analysis of local conditions. The conditions in Wood County happen to be very favorable for force account work and the results being secured under this system are a continued justification of its use.

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[*] From a paper entitled "Concrete Roads in Wood County, West Virginia," presented at the ninth annual convention of the Southern Appalachian Good Roads Association, Bristol, Va., Oct. 16-19, 1917.

[†] County Road Engineer, Wood Co., W. Va.

The fact that Wood County has adopted concrete as the standard type of construction adds greatly to the efficiency of the force account plan.

As to the cost of road construction in Wood County, a comparison of figures indicates that no other cunty in the state is securing more in the way of value received for the money expended. We are building our roads 14 ft. wide, 7 in. thick at the center and 6 in. at the sides, with a 3-ft. berm on either side. The slopes and grades are determined by local conditions. It is thought advisable to spend considerable money in grading rather than to exceed an 8% grade. Although concrete has been used on this maximum grade we have never had any complaints as to slipperiness. The old roadbed is followed wherever possible. Where a portion of the concrete is to be laid over a newly made fill it is rolled to a uniform density and soft spots or spongy places are removed and replaced with suitable material. As the drainage of the roadbed is of vital importance, it has been found wise road insurance to provide French drains or tile drains wherever needed in the subgrade. While the fact should not be taken as an excuse for neglect in the preparation of the subgrade, it is nevertheless true that a concrete road slab will bridge over numerous defects or soft spots in the subgrade and no serious results will follow. From our experience we have found that much importance attaches to the destruction and scarifying of the old roadbed in order to have a subgrade of uniform density under the new road. It has been frequently observed that when we had a soft spongy subgrade and expected cracks in our slabs not a single crack appeared. What few cracks have developed in our roads have been in slabs partly overlaying the former solidly compacted earth roadbed.

For aggregates we use washed and screened Ohio River sand pebbles. These come to the job separately by team or motor truck and are mixed with cement in the approximate proportions of 1:2:4. The voids in these aggregates run approximately constant and it is, therefore, possible to secure a remarkably uniform quality of concrete. The various ingredients are measured separately in such a way as to insure the proper proportions at all times.

The materials are mixed in a batch mixer until the cement is uniformly distributed and the concrete is uniform in color. Only enough water is used to produce a concrete that can be spread into position with a template or straight-edge. The amount of water used is not sufficient to cause a separation of coarse aggregates from the mortar and depends somewhat on the water content of the sand. Definite specifications on this point are difficult to observe. Continued experience coupled with a desire for high quality of work will usually provide the best guide. After mixing, the concrete is deposited rapidly upon the subgrade which has been sprinkled to prevent absorption of water from the concrete. A strikeboard is used to give the surface of the pavement the proper contour and the finishing is done by hand with wooden floats operated from a bridge resting on the forms. No one is allowed on the concrete after it has been worked into position until it has thoroughly hardened.

Much publicity is now being given the roller method of finishing, as inaugurated by Capt. J. J. Gaillard of Macon, Ga. Uniformly excellent results and low cost are claimed for this method by those who are using it. It is possible that Wood County may see fit to adopt this method if results obtained elsewhere continue to support its use.

Extreme care is always used in curing the green concrete. In hot summer weather canvas is placed on the new surface and kept wet for several days to prevent too rapid drying out. Following this the pavement is covered with several inches of earth and kept moist by sprinkling for a week or more. Where the grade of the road will permit, earth dams are built on the surface and the ponding method is used.

Concrete is weakest when it is new. From tests made both in the laboratory and in the field it has been demonstrated that during the first five years of its life concrete is constantly increasing in strength and in ability to resist the wear of traffic. Our experience has been that the longer traffic can be kept from a new piece of concrete the better it will be for the road and the greater will be the possibility of its acquiring those qualities of hardness and toughness which are characteristic of this type of road when properly built. None of our roads are opened to traffic in less than two weeks. This period is extended if no serious inconvenience is occasioned by a further delay to traffic.

It has been our practice to install at intervals of from 25 to 50 ft. metal protected joints of the bituminous fiber matrix type. The tendency of our present practice is to lengthen the distance between joints. On long slabs over newly made, heavy fills where there is a possibility of further settlement, the joints are omitted altogether, our theory here being that if cracks should occur the interlocking effect of the coarse aggregate will prevent any relative motion of adjacent slabs and thus preserve a smooth riding surface.

Up to the present time reinforcing has not been extensively used, although there is now being considered the question of the advisability of omitting the joints and and putting the money thus saved into reinforcing.

Illinois Counties Pass Large Bond Issues

The recent passage of bond issues for large amounts by counties in Illinois indicates that road construction in that state is to go forward without interruption.

At the Nov. 6 election, Cook County voted to raise $1,000,000 by the issuance of bonds for the improvement of several important projects in the county. This amount, it is stated, will be returned to the county if the state bond issue of $60,000,000 is ratified by the people at the November, 1918, election.

Among the highways sought to be improved by the proceeds of the county issue are the Lincoln Highway, the Archer Road, the Starved Rock Road, the road to Joliet, Peoria and Springfield, the Homewood-Lansing Road, the highway traversing the Des Plaines River district, and the Chicago-Milwaukee Road. The latter parallels the Sheridan Road, and is intended to divert heavy traffic from this military highway.

The Chicago-Milwaukee Road is also to be a military highway. Lake County, through which it passes, held an election on Oct. 30 at which it was decided to raise $500,000 by bond issue. It is expected that this amount, with state and federal aid, will provide for the construction of the road mileage in that county. Of the $400,000 contributed toward the cost of the Chicago-Milwaukee Road by the state and federal government, Lake County will receive $325,000, and Cook County, $75,000.

The citizens of Sangamon County passed an issue of $500,000 on Nov. 6. It is expected that it will provide for the construction of a north and south cross-county highway and aid in the improvement of the Beardstown and South Sixth Street Roads.

Other counties in the state have already issued bonds for the building of the route from Chicago to St. Louis by way of Springfield. Macoupin and Madison will hold elections on Dec. 4, the amount to be voted on in the former being $160,000. With favorable action by these two counties, provision will have been made for the construction of a continuous improved route between the two cities.

The Wisconsin Survey of Road Conditions

The statute enacted by the Wisconsin Legislature of 1917 providing for the cooperation of the state with the federal government in the construction of federal aid roads required the State Highway Commission to select a system of state trunk highways to which the federal aid construction would be confined. It was specified that the system should connect all county seats and all cities with a population of 5,000 or more. After May 1, 1918, the counties must maintain the entire system, the unimproved portions as well as the portions which have previously been improved under the state highway law or otherwise. The cost of construction and maintenance is to be paid from the proceeds of automobile licenses. All construction will be administered by the State Highway Commission direct. The maintenance will be administered by the counties under the direction of the State Highway Commission and paid for by the state. Effective control is guaranteed by a provision in the law authorizing the State Highway Commission to withhold payment for work improperly done.

The law required that this system should be selected prior to Nov. 1, 1917. As the law did not become effective until July 11, any ordinary methods of surveying these routes could not possibly cover the ground within the required time. A system was devised which, it is believed, gave the required information with a minimum of expense and a maximum of speed. The information obtained is such as will permit making intelligent estimates of the cost of future construction and maintenance and proper comparisons between alternate or competing routes. The surveys are, in effect, reconnoissances; all future construction will be based on proper instrument surveys.

All mileage measurements were made by automobile speedometer. The survey force consisted of two men, an observer, who also drove the car, and a recorder. The notes were taken on a specially devised blank, and were recorded by means of a code system.

Prior to beginning the survey, all speedometers to be used were carefully checked against a measured distance. The variations ranged from a few feet to more than 200 ft. per mi. It was found that these errors were caused by slight variations in the sizes of the tires of the car, and they were corrected by the use of tires of exact diameter.

A specimen of the record sheet is shown in the illustration. The code is printed on this page. The record sheet is ruled horizontally into 28 spaces, one for each subject on which information is desired, and vertically into 10 spaces, each representing one-tenth mile. The subjects are arranged so that those related occur together, thus making a logical arrangement of the record and facilitating both the recording and reading of the notes. The records were made almost entirely by numbers, it having being found that figures could be recorded more rapidly than letters. The record was made while the car was in motion except for stops which were made to measure culverts or bridges, and stops at the end of each mile to fill in the title blanks at the top of the sheet and make estimates of maintenance and imperative construction. All widths of right of way, distances between ditches, widths of traveled way and surfacing were estimated.

SYMBOLS USED IN CONDITION SURVEY OF STATE TRUNK HIGHWAYS.

1-A.—TYPE.

1, Earth; 2, Sand-clay; 3, Shale; 4, Gravel; 5, Gravel, surface treated; 6, Stone macadam; 7, Stone macadam, surface treated; 8, Bituminous macadam; 9, Concrete; 10, Bituminous concrete; 11, Asphalt; 12, Brick; 13, Other, give name.

I-B.—CONDITION.

1, Good; 2, Fair; 3, Poor; 4, Rebuild immediately.

2-A.—SOIL.

1, Heavy clay; 2, Light clay or loam; 3, Sand; 4, Marsh.

2-B.—DRAINAGE.

1, Good; 2, Fair; 3, Poor; 4, None whatever; 5, Center lower than ditch line.

3.—SPECIAL CONDITIONS.

1, Mud hole; 2, Rock outcrop; 3, Present cut; 4, Present fill; 5, Sidehill; 6, Dangerous ditch.

4.—TRAVELED WAY; SURFACING.

Insert, in order, estimated width of traveled way and of surfacing, as 18′-9′.

5.—BETWEEN DITCHES; FENCES.

Insert, in order, estimated width between ditches and between fences, as 24′-48′.

6.—WOODEN BRIDGE, CULVERT.

1, Good; 2, Fair; 3, Poor; 4, Rebuild immediately.

7.—STONE BRIDGE, CULVERT.

1, Good; 2, Fair; 3, Poor; 4, Rebuild immediately.

8.—STEEL BRIDGE, CULVERT.

1, Good; 2, Fair; 3, Poor; 4, Rebuild immediately.

9.—CONCRETE BRIDGE, CULVERT.

1, Good; 2, Fair; 3, Poor; 4, Rebuild immediately.

10.—ADDITIONAL BRIDGE, CULVERT.

11.—NUMBER OF SPANS; OPENING; CLEAR ROADWAY.

Give number of spans, size of opening, and width of clear roadway.

12.—FLOOR; FLOOR TO STREAM BED.

1, Concrete; 2, Creosoted blocks; 3, Plank.
1, Good; 2, Fair; 3, Poor; 4, Rebuild immediately.
Give distance from floor to stream bed.

13.—FOUNDATIONS.

1, Wooden Piles; 2, Stone Masonry; 3, Steel Tubes; 4, Concrete.
1, Good; 2, Fair; 3, Poor; 4, Rebuild immediately.

14-A.—INTERSECTING ROADS.

1, State Trunk; 2, State Aid System; 3, Town Road.
1, Right; 2, Left; 4, Four corners; 5, Five corners.

14-B.—TRAFFIC.

1, Heavy; 2, Medium; 3, Light.

15.—TURN; ANGLE.

1, Right; 2, Left. (In degrees right and left from foresight.)

16.—VISION; DANGER.

1, Good; 2, Fair; 3, Poor; 1, Safe; 2, Medium; 3, Dangerous.

17.—POSSIBLE RELOCATION.

1, Right; 2, Left. Show limits of and estimate distance increased or diminished.

18.—RAILWAY AND STREET RAILWAY CROSSINGS.

Locate thus, | |, with angle.
1, Grade; 2, Overhead; 3, Undergrade.
1, Good; 2, Fair; 3, Poor; 4, Rebuild immediately.
1, Safe; 2, Medium; 3, Dangerous.

19.—RAILWAYS AND STREET RAILWAYS WITHIN THE RIGHT OF WAY.

Locate thus, ...
1, Right; 2, Left; 3, Center.
1, Safe; 2, Medium; 3, Dangerous.

20.—GOVERNMENT LIMITS.

Locate town, village, city, and county limits. Name central point in village or city. Also attach plat or map showing streets on trunk system.

21.—CITY CONSTRUCTION LIMIT.

Locate limits where, in your judgment, construction should stop as per federal act.

22.—R. F. D. BOXES; TRAIL.

1, Right; 2, Left. Note trail followed, if any.

23.—SCHOOL HOUSE; TOWN HALL.

S, School House; H, Town Hall.
1, Right; 2, Left.

24.—CHURCH; FACTORY.

C, Church; F, Factory.
1, Right; 2, Left.

25.—FARM RESIDENCE; CEMETERY.

R, Farm Residence; Cem, Cemetery.
1, Right; 2, Left. Write owner's name in each mile.

26.—1917 STATE AID WORK.

Locate as near as possible all construction for which funds are available.

27.—MISCELLANEOUS.

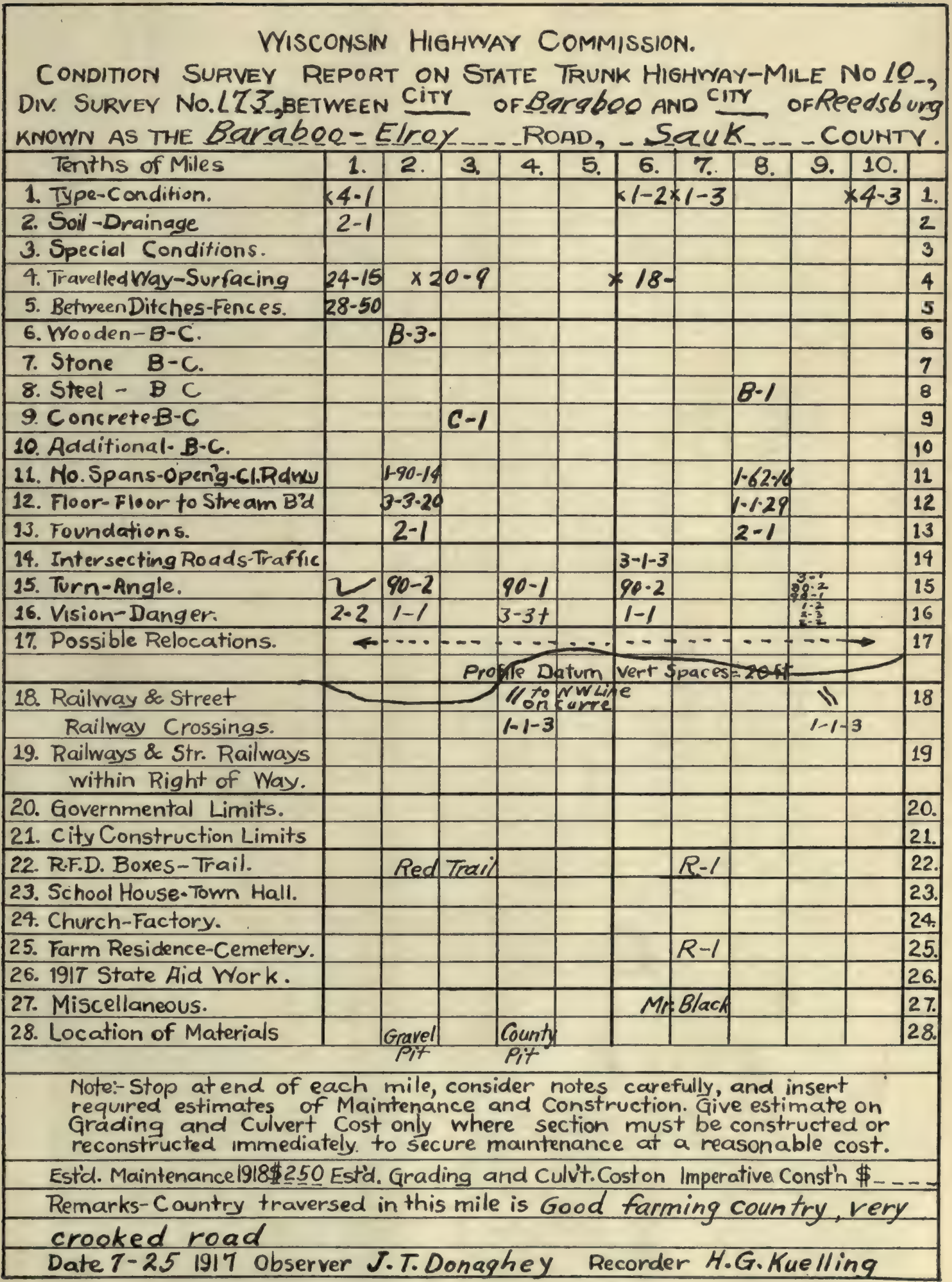
28.—LOCATION OF MATERIALS.

Give location of local materials available for construction and maintenance.

29.—REMARKS.

Describe any difficult construction feature, extremely dangerous point, or other matter of interest.

The title of the specimen sheet shows the location of the road and mile under survey. The mile recorded on the sheet shown begins with a gravel road in good condition which continues to the end of the fifth tenth, where there



WISCONSIN HIGHWAY COMMISSION.

CONDITION SURVEY REPORT ON STATE TRUNK HIGHWAY-MILE NO 10,
DIV. SURVEY NO. 173, BETWEEN CITY OF Baraboo AND CITY OF Reedsburg
KNOWN AS THE Baraboo-Elroy ROAD, Sauk COUNTY.

Tenths of Miles	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	
1. Type-Condition.	x4-1					x1-2	x1-3			x4-3	1.
2. Soil-Drainage	2-1										2.
3. Special Conditions.											3
4. Travelled Way-Surfacing	24-15	x 20-9				x 18-					4
5. Between Ditches-Fences.	28-50										5
6. Wooden-B-C.		B-3-									6
7. Stone B-C.											7
8. Steel - B C								B-1			8
9. Concrete B-C			C-1								9
10. Additional-B-C.											10
11. No. Spans-Open'g-Cl. Rdwy		1-90-14						1-62-16			11
12. Floor-Floor to Stream B'd		3-3-20						1-1-29			12
13. Foundations.		2-1						2-1			13
14. Intersecting Roads-Traffic						3-1-3					14
15. Turn-Angle.		90-2		90-1		90-2			3-1 90-2 98-1		15
16. Vision-Danger.	2-2	1-1		3-3+		1-1			1-2 2-3 2-2		16
17. Possible Relocations.	←									→	17
			Profile Datum			Vert Spaces = 20 ft					
18. Railway & Street				// to NW Line on curve					\\		18
Railway Crossings.				1-1-3					1-1-3		
19. Railways & Str. Railways											19
within Right of Way.											
20. Governmental Limits.											20.
21. City Construction Limits											21.
22. R.F.D. Boxes-Trail.		Red	Trail				R-1				22.
23. School House-Town Hall.											23.
24. Church-Factory.											24.
25. Farm Residence-Cemetery.							R-1				25.
26. 1917 State Aid Work.											26.
27. Miscellaneous.						Mr.	Black				27.
28. Location of Materials		Gravel Pit		County Pit							28.

Note:- Stop at end of each mile, consider notes carefully, and insert required estimates of Maintenance and Construction. Give estimate on Grading and Culvert Cost only where section must be constructed or reconstructed immediately to secure maintenance at a reasonable cost.

Est'd. Maintenance 1918 $250 Est'd. Grading and Culv't. Cost on Imperative Const'n $___

Remarks- Country traversed in this mile is Good farming country, very crooked road

Date 7-25 1917 Observer J. T. Donaghey Recorder H. G. Kuelling

TYPICAL FILLED IN RECORD SHEET USED IN THE SURVEY OF ROAD CONDITIONS MADE BY THE WISCONSIN STATE HIGHWAY COMMISSION FOR THE PURPOSE OF SELECTING ROADS FOR FEDERAL AID.

is an earth road in medium condition which continues for one-tenth, where it becomes poor, and continues so to the end of the ninth tenth, where a gravel road in poor condition begins and continues to the end of the mile. The soil for the entire mile is a light clay; drainage good. The road follows the surface of the ground all the way. The width of traveled way at the beginning is 24 ft.; the surfacing is 15 ft. This continues to the middle of the second tenth, where the traveled way and surfacing narrow to 20 ft. and 9 ft., respectively, and so continue to the end of the fifth tenth. The last five tenths have a traveled way of 18 ft.

In the second tenth there is a wooden bridge consisting of a single span of 90 ft., 14-ft. roadway. The floor is of planks in poor condition; distance from grade to stream bed 20 ft. The foundations are of stone in good condition. In the third tenth there is a concrete culvert in good condition, size 2x2 ft., 24 ft. long. In the eighth tenth is a steel bridge in good condition, a single span of 62 ft., 16-ft. roadway. The floor is reinforced concrete in good condition; distance from grade to stream bed 29 ft. The foundations are stone in good condition.

A town road, carrying light traffic, turns off to the right in the sixth tenth. This mile is crooked at the beginning. A tortuous curve, medium vision, reasonably safe, is shown in the first tenth. In the second tenth there is a 90-degree turn to the left, good vision; in the fourth tenth a 90-degree turn to the right, poor view, exceedingly dangerous; and in the sixth tenth another 90-degree turn, this time to the left, good view, safe. In the ninth tenth there are three turns; 3 degrees to the right, good view, medium safe; 80 degrees to the left, medium view, dangerous; and 90 degrees to the right, medium view, medium safe. An advantageous relocation of the entire mile is possible.

In the fourth tenth there is a dangerous grade crossing with the C. & N. W. Ry. The physical condition of the crossing is good. The same thing occurs again in the eighth tenth. Evidently the purpose of the suggested relocation is to avoid these two crossings. In the seventh tenth a mail box belonging to Mr. Black, whose residence is on the right hand side of the road, is noted. This indicates that the road is a mail route and thus eligible to federal aid.

It is estimated that this mile can be maintained in reasonably good condition in 1918 for $250, without any additional grading or culvert construction.

After the survey is completed, a summation of the total number of miles is made in a space provided at the bottom of the blank. (This is not shown in the illustration.) To insure uniformity, estimates of maintenance costs are made from a schedule of estimated maintenance costs for each type and condition of road. These range from $35 per mi. for 18-ft. concrete roads in first class condition, $150 per mi. for earth roads in third class condition to $450 per mi. for 9-ft. macadam surfacing in third class condition. The profile shown is intended to indicate only in a very approximate way the true ground level, and was plotted from observations of rise and fall made by the observer, assisted by a gradiometer attached to the body of the car, the elevation being taken as zero at the beginning of each mile. No attention was paid to light grades of 1% or 2% or to the very short grades of anything less than 6%. The profile indicates whether the road is smooth, rolling or rough. The information noted is supplemented by photographs. Each party carried a camera and had instructions to photograph sections of road typical of the mile traversed, also any particularly dangerous situation. These photographs are attached to the mile sheet on which they occur.

The work is practically completed, the selection of the 5,000-mi. system requiring condition surveys of about 7,500 mi. of road. The cost is $1.20 per mi. The results are very satisfactory for the purpose intended, and it is doubted if any more complete information could be secured in any other way except at greatly increased cost.

Surveys for State and Federal Aid Roads in North Dakota

Surveys have been completed for highways to be constructed with state and federal aid in Benson, Bowman, Cavalier, Foster, Grand Forks, Griggs, La Moure, Ramsey, Richland, Stark, Towner and Williams Counties, North Dakota, according to advices from that state. The work of making surveys of roads in other counties is in progress. Construction work has been started in Grand Forks County.

A Highway Committee Added to the Council of National Defence

A committee on highway transportation has been created by the Council of National Defence, according to an announcement by Director Walter S. Gifford.

The committee, officially designated as the Highways Transport Committee, consists of Roy D. Chapin, President of the Hudson Motor Car Co., Detroit, Mich.; Logan Waller Page, Director of the Office of Public Roads and Rural Engineering, U. S. Department of Agriculture, Washington, D. C.; Henry G. Shirley, Chief Engineer of the Maryland State Roads Commission, Baltimore, Md., and George H. Pride, President of the Heavy Haulage Co., New York, N. Y.

Mr. Chapin is chairman of the committee.

"Kansas Highways"

"Kansas Highways" is the name of a magazine which has just made its appearance as the official publication of the Kansas Highway Commission. It is to be published quarterly at Topeka and edited by W. C. Markham, the secretary of the commission.

Volume 1, Number 1, dated October, 1917, is 9x11½ in. in size and consists of 24 pages, including covers. The front cover carries a cut of the bridge over the Kansas River at Lawrence and a table of contents. The inside front cover is taken up by a roster of the commission and a list of the county engineers. The back cover carries a cartoon depicting the advantages of good roads for troop movements. The covers and the inside pages are of white paper.

The leading article, "The Kansas Highway Commission," is by Governor Arthur Capper, who is ex-officio chairman of the commission. Among the other articles are the following: "Need of Centralization in Highway Control," by Logan Waller Page, Director of the Office of Public Roads and Rural Engineering, U. S. Department of Agriculture; "What Type of Road to Build in Kansas," by State Highway Engineer W. S. Gearhart; "The National Old Trails Road," by Judge J. M. Lowe, President of the National Old Trails Association; and "How to Secure Federal Aid for Road Building in Kansas." A brief review of the outstanding features of the road situation in various other states is presented under the caption "Road Building Throughout the Nation," and an article of a similar nature dealing with county work is printed under the head, "Road and Bridge Work in the Kansas Counties."

The magazine is illustrated by a number of halftones and some line cuts. Among the halftones are two views of improved roads in Iowa, reproductions of two photographs of road exhibits at the Topeka Free Fair and the Hutchinson State Fair, two views of roads in Bourbon County, Kansas, two views of improved New York roads and three of scenic highways in California.

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Founded January, 1892

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New Series, Vol. XIV
Number 20

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

November 17, 1917

A STEP IN THE RIGHT DIRECTION

The appointment of the Highways Transport Committee, noted elsewhere in this issue, is highly gratifying to those engaged in the building of roads. While it is understood that the committee will deal with the problems of transportation rather than construction and maintenance, the two are so interdependent that any step benefiting one will react to the benefit of the other.

Ever since the United States entered the war, "Good Roads" has urged that road work be not allowed to stop or lag; that, instead, it be continued with increased vigor; and that the work done be carried out with a view both to possible military use of the roads and to their use for the extraordinary traffic directly or indirectly due to the war. The force of the arguments for continued and increased activity are, we believe, generally acknowledged by those conversant with the commercial and industrial needs of the country and the relation of good roads to those needs.

In most states efforts have been made to keep road work going, but the officials, engineers and contractors have encountered difficulties that at times have seemed insurmountable. The labor shortage, already serious enough when war was declared, has grown more and more troublesome all through the season. Prices of materials have advanced to a point where they make road building costly, especially when added to the higher wages that have had to be paid to uncertain and often inefficient labor. In addition to these there have been embargoes and restrictions delaying the receipt of much needed machinery and materials.

This inability to obtain supplies only after costly delays, if at all, has probably been the most serious handicap. In some instances, indeed, it has been the last straw, making the load on the contractor more than he could carry and resulting in the complete stoppage of work. Some of these restrictions—such, for instance, as the order prohibiting the use of open top cars for the shipment of road materials—have seemed unnecessary and the result of a lack of understanding, on the part of those responsible, of the especial importance of road work at this particular time.

Though the appointment of the Highways Transport Committee can not be expected to result in the immediate rescinding of any of these orders, it will be reassuring to road builders to know that they are represented in the Council of National Defence. In most parts of the country the road building season is practically at an end and it is reasonable to hope that before the commencement of the 1918 season, the committee will have succeeded in working out some plan of relief and having it adopted by the council and the authorities.

THE WISCONSIN ROAD CONDITION SURVEY

An interesting piece of work is described elsewhere in this issue in the article entitled, "The Wisconsin Survey of Road Conditions."

Wisconsin has about 76,000 mi. of public roads. In order to select a 5,000-mi. system for improvement by federal aid it was necessary to make a condition survey of about 7,500 mi. The completion of the survey, therefore, puts in the hands of the State Highway Commission detailed information as to the location, character and condition of practically one-tenth of the entire road system of the state. As the roads surveyed connect all county seats and all cities of 5,000 or more inhabitants, they are, of course, the main roads, and presumably carry more than 75% of the traffic in the state outside of cities.

Most state highway departments, especially in the states that have had departments for any length of time, have maps and records from which can be obtained information corresponding to that gathered by the Wisconsin survey. The Connecticut State Highway Department, for instance, has completed or nearly completed, a comprehensive investigation of the bridges on the state trunk line system. New Jersey has mapped its main routes, and many other states have carried out similar projects. At the same time it is doubtful if many states have on file such detailed data as Wisconsin has, covering approximately 10% of the roads of the state.

The Wisconsin work furnishes a striking example of the value of the automobile. Without its aid the work could hardly have been done within the time allowed and certainly could not have been carried out at the very low cost of $1.20 a mile.

An understanding of the results achieved and the methods used immediately suggests how valuable similar surveys might be to the military establishment. The method of recording is sufficiently simple and flexible to be adaptable to other user than that to which it is to be put in Wisconsin, and by such adaptation could be made to cover features of military significance.

◆

The Voters of Lake County, Illinois, have passed a bond issue of $500,000 for highway improvement purposes by a majority of two to one.

Scott and New Madrid Counties, Mississippi, have recently voted to issue bonds for road and bridge improvement in the sums of $750,000 and $800,000, respectively.

The 34 Townships of Itasca County, Minnesota, have levied a tax of about $88,000 for the construction and maintenance of roads and bridges. The county levy for road improvement, made in July last, was $135,000, the tax levied on account of federal aid amounting to $35,000 additional.

All Dixie Highway Projects Between Nashville and Chattanooga, Tenn., have been approved for federal aid by the State Highway Commission, with the exception of routes through Rutherford and Marion Counties, which have not complied with the provisions of the federal law.

Rejects Bids for State Aid Work in Lackawanna County, Pennsylvania

The rejection of eight bids for the construction of a highway project in Moosic and Old Forge Boroughs, Lackawanna County, Pennsylvania, resulted from the fact that the roadway to be improved did not form a connecting link between improved roads, as required by the highway law of the state. The 6,562 ft. of highway was to be of reinforced concrete construction, 16 ft. wide. Gibbons & Buckley, of Philadelphia, submitted the lowest bid, $25,498.96.

Missouri Townships May Vote Highway Bonds

The Attorney General of Missouri, in a recent opinion, declares that the power to vote bonds for highway and bridge improvement is conferred upon townships by the road law of the state, regardless of whether or not the county is under township organization.

The county court has the authority to administer the funds raised by the sale of township bonds, as provided by Sections 88 and 89 of the laws of 1917, the work being performed under the direction of the county highway engineer. It is mandatory for the county court to call an election to vote bonds for highway purposes upon the filing of a petition with the county clerk, signed by 20 legal voters.

The issue must not exceed 5% of the assessed valuation of the township. The bonds bear interest at not to exceed 6%, and must mature in not exceeding fifteen annual instalments, the first to become due not later than two years from date.

Military Truck Test on the Dixie Highway

A military motor truck test was conducted over the Dixie Highway between Ft. McPherson, near Atlanta, Ga., and Ft. Oglethorpe, Ga., near Chattanooga, Tenn., on Tuesday, Oct. 30. The test was in charge of the military authorities of Atlanta and Ft. Oglethorpe, and was made for the purpose of demonstrating the practical need of constructing the Dixie Highway for military uses.

According to a report from the Dixie Highway Association, which inaugurated the test, the results as compiled by officers of the Quartermaster's Department of the U. S. Army show a saving of $2.89 per man and at least 3 hours in time over special train service in the transportation of 18 infantry soldiers with full marching equipment.

The distance of 135 mi. by way of Rome, Ga., was covered by a White truck on which had been mounted a special body designed by Lieut.-Col. H. J. Gallagher, Depot Quartermaster at Atlanta, in 5 hours and 32 minutes, or an average of 24 mi. an hour. The distance of 125.7 mi. by way of Dalton was covered in 5 hours and 1 minute, a speed of 25 mi. an hour.

Six 2-ton freight trucks with clothing and hardware consigned to Maj. A. L. Bump, Quartermaster at Ft. Oglethorpe, made the trip on the same date over both routes of the highway. The first truck to arrive at the Lytle Warehouse at Ft. Oglethorpe over the Dalton route made the distance of 117 mi. in 8 hours and 7 minutes, and the first truck to arrive over the Rome route made the trip of 135 mi. in 8 hours and 30 minutes. All of the trucks entered consumed less than 12 hours in making the trip.

Owing to the fact that the trucks were able to deliver their loads at the point wanted, the saving in time over freight shipments by rail has been estimated from 12 to 36 hours. It is also believed that a saving in cost will be shown in favor of the highway.

That it would be feasible to supply the large military encampment at Ft. Oglethorpe from the Atlanta Depot by motor trucks was proved conclusively, according to a statement by Maj. Bump, and it was also shown that two trains of 30 trucks each, making the round trip in three days, allowing one day for loading and overhauling the trucks, would be able to handle practically all of the supplies needed.

One hundred and twenty tons of supplies could in this way be delivered every three days at Ft. Oglethorpe. It would be necessary, of course, for the Government to give some assistance to the counties along either route selected for military use, in providing a road which would withstand the pounding of the trucks under all weather conditions. It is pointed out that similar conditions would apply to other encampments at Macon and Augusta, Ga., Greenville and Spartanburg, N. C., and possibly Columbia, S. C.

In commenting upon the truck test, Lieut.-Col. Gallagher said:

"The men were left where they were wanted, fresh, ready for business, and had their full marching equipment with them. No reasonable comparison can be made between this method of transportation and any other. It has fixed its place, in my opinion, as superior to any other means of handling soldiers, and it is only a question of time when it will be a recognized institution in our army."

Bonds for Highway Improvement in Texas

A road bond issue of $600,000 was passed in Shelby County, Texas, on Oct. 27. The election which occurred Nov. 3, in Troup Road District No. 6, Smith County, on an issue of $150,000, and in Pyote District, Ward County, $80,000, resulted favorably.

In Harden County an election was called for Nov. 17 to vote on an issue of $250,000 for improvements in Road District No. 3. For the same date an election was also called on a proposal to issue $80,000 worth of bonds for work in Wise County; and on Nov. 19 Madison County will decide the question of an issue of $100,000. Randall County will pass on a proposed issue of $50,000 on Nov. 24. An election has been called for Dec. 18 in every road district crossed by the Central Route, between San Antonio and Houston, to vote on a proposal to issue bonds to build 309.9 mi. of 16-ft. road.

Road bond elections have been proposed for the following counties and amounts: Bell, $250,000; Millican District, Brazos County, $70,000; Foard, $75,000; Harwood District, Gonzales County, $50,000; Hartley, $100,000; Kerr, $50,000; Scurry, $100,000.

The election in Cameron County called for Nov. 3, was canceled. The amount of proposed bonds was $200,000.

Applications for Motor Vehicle Registrations and Licenses in Pennsylvania

Applications for 1918 registrations and licenses for motor vehicles in Pennsylvania numbered 5,100 at the first of the present week, according to advices from the Automobile Division of the State Highway Department. The money accruing threfrom amounted to $40,835.

Owners and operators of motor vehicles are urged by the department to make early application for registration and license tags, as all motor vehicles must carry the 1918 tags on Jan. 1.

Corporations, manufacturers, department stores and other organizations employing many of the larger trucks and automobiles, are especially urged to send in their applications for 1918 license plates without delay in view of transportation over the main highways, which is expected to continue throughout the winter.

Special preparations for the prompt handling of the increased business have been made by the Automobile Division, and attention is directed to the law which requires that an affidavit, properly filled out, accompany all applications for motor vehicle licenses.

Annual Highway Budget of Huntington Township, Long Island

The annual highway budget of Huntington Towship, Suffolk County, Long Island, as prepared by the Huntington Town board, calls for an expenditure of $104,300. Portions of this amount will be applied as follows: To building concrete roads at Huntington Village and Huntington Station, $27,000; improving the macadam highway between Northport and Cold Spring Harbor, $20,000; and improving roads with cinders and trap rock, $7,000.

Minnesota to Have Largest Road Building Year in 1918

Minnesota will undertake the largest amount of road and bridge building in 1918 that it has ever attempted in a single year, according to C. M. Babcock, State Highway Commissioner, who reports that all over the state the counties are preparing big road building programs.

Commissioner Babcock says that the average county increase will be about 40% over 1917. Added to the county building which the state will greatly aid, there will be the federal aid roads costing almost $1,000,000, of which the Government and state will each pay half. The Commissioner also states that all but a few counties have sent in their reports and that 1918 will be the banner year.

Road Work in Wayne County, Michigan, During the Past Year

The eleventh annual report of the Board of County Commissioners of Wayne County, Michigan, shows the highways that were completed or were under construction during the fiscal year ending Sept. 30, 1917.

With the exception of emergency roadways, the mileage built during the year was of 2-course concrete construction, the specifications having been changed from 1-course to 2-course on account of the difficulty of securing a sufficient quantity of pebbles to meet the requirements as to uniform quality and grade. Wisconsin granite or trap rock was used for the wearing surface, and washed pebbles or crushed limestone for the lower course. The preference of the board, however, is for 1-course construction, with other things equal, on account of the additional expense as to labor and the cost of coarse aggregates for the wearing surface. Another change in the specifications is that of increasing the width of expansion joints from ¼ to ½ in., as it was found that several roads six or seven years old had buckled, and the slabs had slipped over adjoining sections. The report states that a more rigid inspection is being given to aggregates, consistency, mixing, finishing, curing, preparing of subgrade, alignment, laying out and widening curves, which, though adding to the cost, also adds to the quality, appearance, safety and life of the roadway.

The construction of the Fort Road, started last year, was completed, a distance of about 2 mi., and it now connects the Eureka Road west of Wyandotte with the concrete road built previously. This is of concrete, 16 ft. wide, 28 ft. over all. There is now a contiuous improved highway from Oakland to Wyandotte. The uncompleted portion of the Mack Road between St. Clair Heights and the county line, about 7 mi., is to be finished and opened to traffic late this fall. This road, which is of 2-course concrete construction, 20 ft. wide, 30 ft. or wider over all, replaces an old stone road. It is expected to divert traffic from Jefferson and Gratiot Roads. On the Seven Mile Road from Woodward Avenue Road westward to Northville, a distance of about 18 mi., there remains a short stretch west of Grand River Road to be concreted this fall. The Seven Mile Road is a part of the Outer Belt Route, a marginal highway encircling the county. There will still remain one unimproved section of the Outer Belt Route, the Belleville Branch of the Huron River Drive which connects Belleville and Romulus. A trunk line bridge is being built by the state over the Huron River at French Landing, upon the completion of which the work of improving the road, which has been taken over by the county, will be carried forward as rapidly as possible. The Eight Mile Road which forms the dividing line between Detroit and Oakland County, from Woodward Avenue Road to the Ridge Road, a distance of 7,300 ft., was macadamized, as a detour, the City of Detroit having no funds available to improve the road. Sufficient funds for the work were diverted from the available maintenance fund of the county, the cost being $10,389.94.

The county expended $53,344.15 for maintenance work. At the close of the fiscal year covered by the report, the county had assets consisting of cash ($215,744.90), taxes and material and stock on hand, amounting to $255,944.41, and credit balances amounting to $11,199.06.

Of the $2,000,000 in county road bonds authorized about six years ago, $1,300,000 is outstanding, with $100,000 to be retired at an early date. The report states that practically all of the amount with an additional $1,300,000 raised through county roads taxation, state reward and other sources, was expended or will be expended for concrete road construction, and that the roads already built are in first-class condition, with every promise of outliving the bonds.

Some slowing down in road building was unavoidable owing to the fact that labor was scarce, high priced, and required frequent reorganization of crews, and the shipment of materials in box cars rendered useless the unloading devices further adding to the shortage of labor. The work planned by the county road authorities was therefore not carried out, as reflected by the cash balance on hand in the county road fund. It is not the intention to levy a county road tax this year.

The ten main roads radiating from Detroit to the county line have been built, as have a number of roads connecting villages and cities. The general plan for road improvement includes three belt lines encircling the county—an outer belt, a middle belt, and an inner belt line. With the exception of about 4 mi., the Outer Belt line will be completed this fall. Work has been started on the other routes.

The board recommends the acquisition of a county park system, by purchase or gift, and explains how the Covert Act which has been the subject of litigation, but has now been sustained, operates for road improvement by permitting a portion of the cost of a road to be paid by an assessment district formed for that purpose, and the balance by the townships and counties, if working under county organization.

The Commissioners of Sedgwick County, Kansas, recently entered upon the county's road building program by the purchase of a White good roads truck at a cost of $6,100.

The Town Board of Brookhaven, L. I., has appropriated $15,000 for the repair of the South Country Road from Center Moriches to Camp Upton. The improvement is to be started immediately, according to report.

The People's Motor Bus Company, of Springfield, Ill., proposes to institute a motor bus service in that city, which will involve the purchase of thirty modern vehicles at a cost of $3,000 per car. The company has asked permission to increase its capital stock from $5,000 to $125,000.

A Contract Was Awarded to the Ambler-Davis Co., of Philadelphia, Pa., for the construction of a section of roadway through Upper Dublin, Upper Moreland and Abington Townships, Montgomery County, Pennsylvania, at its bid of $44,349.60. The section is 6,537 ft. long, and is to be of reinforced concrete construction.

MEETINGS

Calendar of Coming Meetings

Nov. 19-20.—National Paving Brick Manufacturers' Association.—Annual meeting, Cleveland, Ohio. Secretary, Will P. Blair, 830 Engineers Building, Cleveland, Ohio.

Nov. 19-24.—City Managers' Association.—Annual meeting, Detroit, Mich. Secretary, W. L. Miller, City Manager, St. Augustine, Fla.

Nov. 21-24.—National Municipal League.—Twenty-third annual meeting, Hotel Statler, Detroit, Mich. Secretary, Clinton R. Woodruff, 703 North American Building, Philadelphia, Pa.

Nov. 26-27.—Alabama Good Roads Association.—Annual convention, Hillman Hotel, Birmingham, Ala. Secretary, J. A. Rountree, Birmingham, Ala.

Dec. 4-6.—American Association of State Highway Officials.—Annual meeting, Hotel Jefferson, Richmond, Va. Acting Secretary, H. M. Berry, Chapel Hill, N. C.

Jan. 12, 1918.—Northwestern Society of Highway Engineers.—Annual meeting, Benson Hotel, Portland, Ore. Secretary, C. G. Reiter, Hillsboro, Ore.

Jan. 15-17, 1918.—Virginia Good Roads Association.—Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

Feb. 7-9, 1918.—American Concrete Institute.—Annual convention. La Salle Hotel, Chicago, Ill. Secretary H. D. Hynds, 244 Madison avenue, New York, N. Y.

Feb. 8-9, 1918.—American Concrete Pipe Association.—Annual convention. Sherman Hotel, Chicago, Ill. Secretary, J. H. Libberton, 208 S. La Salle St., Chicago, Ill.

Northwestern Society of Highway Engineers

The annual meeting of the Northwestern Society of Highway Engineers will take place at Portland, Ore., Jan. 12, at which time the reports of various committees will be heard and officers elected for the coming year. The present officers of the society are: President, O. Laurgaard, Portland; First Vice President, R. B. Murdock, Coquille, Ore.; Second Vice President, R. M. Gillis, Kalama, Wash.; Third Vice President, Prof. S. H. Graf, Eugene, Ore.; Secretary, C. G. Reiter, Hillsboro, Ore.; Treasurer, J. J. Brooks, Portland.

PERSONAL NOTES

B. B. Burns has been appointed Assistant Highway Engineer of Lincoln County, West Virginia.

Ernest McCulloh, formerly connected with the United States Reclamation Service and with the office of the City Engineer of Los Angeles, Cal., has become associated with the Charles L. Pillsbury Co., of Minneapolis and St. Paul, Minn., in charge of the department of civil engineering.

Wilder & O'Neal, of Houston, Texas, have been appointed engineers for Road Districts Nos. 1 and 2 in Lee County, Texas. In the former the proceeds of a $150,000 bond issue with $20,000 of federal aid will be spent. They are also engineers for Road District No. 1 in Culberson County, where $75,000 from a bond issue and $35,000 from state and federal aid will be used for road improvement.

W. E. Myer, President of the Tennessee Highway Association, has been appointed Fuel Director for the state. The office is non-salaried.

William T. Jacobson, of Portland, Ore., who was associated with the Portland Bridge and Building Corporation for many years, died recently in that city.

Brig.-Gen. W. P. Richardson, President of the Board of Road Commissioners of Alaska, was recently ordered by the War Department to report at Washington, D. C., for active duty.

W. J. Cowell, until recently Assistant City Engineer of Dallas, Texas, and now with the Engineer Officers' Reserve Corps, is in active duty at the training school at Fort Leavenworth, Kan.

L. R. Walker, former Assistant City Engineer of Tucson, Ariz., and now with the Trussed Concrete Steel Co., has been transferred from El Paso, Tex. to the Youngstown, Ohio, office of the company.

State Aid Highways in Illinois will hereafter be designated by the Division of Highways of the Department of Public Works and Buildings, instead of the boards of county supervisors, who heretofore have determined what roads should receive the benefit of state aid money. The new order, it is reported, will provide a more consistent plan for the improvement of continuous routes.

A Road Bond Issue for Greenwood County, South Carolina, was proposed at a recent meeting attended by road officials and prominent citizens. A committee of one from each school district will shortly meet an engineer of the State Highway Department and the amount required for road improvement in the county will be decided upon, after which petitions asking for an election will be circulated.

A State Bond Issue for Road Improvement in Pennsylvania was advocated by Governor Brumbaugh before the Chamber of Commerce of Carlisle, Pa., recently, according to report. He stated that current revenue was insufficient to maintain the roads at a high standard of efficiency, and that, although the cost of road improvement was large, Pennsylvania had no indebtedness and was financially able to meet the expense.

The Equalization of State and Federal Aid Among Texas Counties will be attempted by the automobile clubs of the state, according to report. At a recent meeting of the Dallas Automobile Club a committee was appointed to call a state convention for the purpose of considering the question with a view to cooperating with the State Highway Commission in planning a constructive road building program.

The Union Paving Co., of Philadelphia, Pa., has offered to place its facilities and organization at the disposal of the Government for the building of necessary roads on Hog Island to further the ship building operations there. The company agrees to build the roads without profit to itself, the only conditions being that the plans and specifications for the roads be practical and such as will provide permanent roads after completion, and that the government keep the company's machinery in repair.

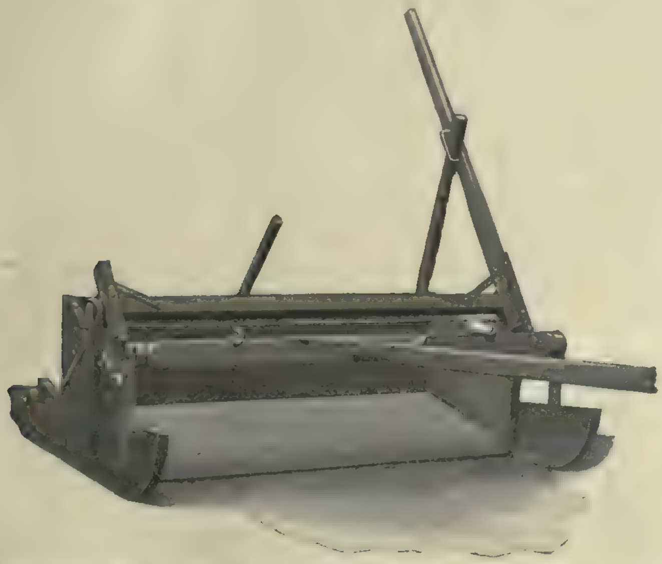
The Improvement of the Middle Island Road from Camp Upton to Smithtown, L. I., by the state is sought by the Supervisors of Suffolk County at the request of Major General Bell. This stretch of dirt road, 16 mi. in length, will become impassable, it is feared, within a few weeks unless improved. There are 15 mi. of macadamized roads in the camp. If the state will improve the Middle Island Road an effort will be made, it is said, to secure an appropriation from the government to macadamize other dirt roads leading to the main arteries and leading out of the camp.

EQUIPMENT — TRADE — MATERIALS

Horse-Drawn Snow Remover

A device for snow removal that works upon the familiar principle of the wheeled or drag scraper for earth handling is shown in the accompanying illustration.

It consists of a wooden receptacle, open at the top and front, hung between two wooden runners and equipped with two operating levers. It is made for use with horses and is furnished in two sizes, one requiring two horses and the other three. Each of the two sizes is 8 ft. in length and 7 ft. wide. The 2-horse machine is 30 in. high, weighs 600 lb. and has a capacity of 1 cu. yd. The 3-horse machine is 42 in. high, weighs 900 lb., and has a capacity of 36 cu. ft. Considerably more can be carried by either machine when the snow is piled up on it.



"ECONOMY" SNOW REMOVER—MANUFACTURED BY THE GOOD ROADS MACHINERY CO.

The position of the box is controlled by two levers. One raises or lowers the front end of the bottom, which is equipped with a steel-shod cutting bar. The other lever moves the box backward or forward. The pole is attached to a bar extending across the front of the machine between the runners and well above them. By this means the pull is exerted partly downward when the cutting bar is in position.

The machine is made of seasoned lumber and thoroughly braced. The runners, as well as the cutting bar, are shod with steel. Among the claims made for the machine are that one of the 3-horse type will take the place of three 2-horse sleds or wagons and from 12 to 15 laborers, and that it can be operated by one careful workman.

It is made by the Good Roads Machinery Co., Inc., of Kennett Square, Pa., and is known as the "Economy" snow remover.

Motor Trucks Used in Building Cantonment Roads

Motor trucks are being used with success in the building of the roads at Camp Funston, Kansas, where one of the most extensive of the cantonment highway systems is being constructed under the supervision of Government engineers.

The roads in the reservation will have a total length of 22.5 mi., of which 8.5 mi. are classed as trunk roads. These are to be built of bituminous macadam, while the remaining 14 mi., comprising secondary roads, will be of water bound macadam treated with hot oil. The trunk roads are 11 in number.

Rock for building the roads and the culverts and bridges is obtained from a quarry situated about half way between Camp Funston and Fort Riley. The Government operates the quarry and delivers the crushed stone to the contractors building the roads. The stone is handled by two crushers having a capacity of 700 cu. yd. of rock per 10-hour day. It is screened into four sizes and hauled to the work in wagons and in a White "good roads truck" purchased by the Government soon after the work was started. This truck hauls from 40 to 50 tons of material daily, the round trip averaging about 6 mi. It is stated that the truck does the work of at least twelve teams.

Another truck of the same make, equipped with a distributor, is used for applying bituminous materials.

White Truck with Distributor Applying Tar in Building Bituminous Macadam

White "Good Roads Truck" Hauling Stone from Government Crusher to Road Contracts

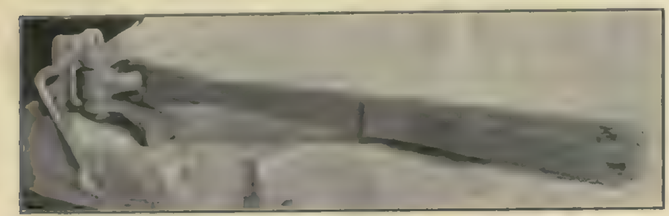
MOTOR TRUCKS IN USE ON CANTONMENT ROAD BUILDING AT CAMP FUNSTON, KANSAS

New Trailer Hitch

A new hitch for coupling a motor truck and trailer is shown in the accompanying illustration.

The hitch consists of two parts, a coupling device to be attached to the truck and a connecting bar for attachment to the trailer coupling. The coupling device is attached to the rear of the truck frame by means of bolts that straddle the frame member, thus eliminating the necessity of drilling and permitting changes from one truck to another The main casting is of malleable iron and the jaws are of cast steel.

In making a coupling the operator raises the hand lever, parts the jaws on the coupler, and then guides the connecting bar into the apron of the hitch. This leads the bar into the jaws, which automatically close. As the jaws come together in front they open at the rear, allowing the hand lever to drop and throwing a lug between the backs of the jaws. This makes it impossible to open the jaws and release the connecting bar without raising the hand lever. To uncouple, the lever is raised and the truck pulls away.



NEW COUPLING DEVICE FOR TRAILERS—MADE BY THE TROY WAGON WORKS CO.

All parts of the device are carefully machined and assembled to prevent rattle and lost motion.

The hitch is manufactured by the Troy Wagon Works Co. of Troy, Ohio.

Clay Products Association

A new organization formed to promote the use of vitrified block and sewer pipe is the Clay Products Association, which has established headquarters in the Chamber of Commerce Building, Chicago, Ill. It is stated that the association will take an active interest in securing improved drainage of highways and the construction of hard-surfaced roads.

The following officers have been elected: President, L. G. Blackmer, St. Louis, Mo.; Vice President, E. S. Hoyt, Red Wing, Minn.; Treasurer, J. L. Scott, Macomb, Ill.; Secretary and General Manager, George H. Tefft, Kansas City, Mo.

A Booklet on Creosoted Wood Block Pavement

"The New and More Economical Creosoted Wood Block Pavement" is the title of a booklet on creosoted wood block paving construction recently issued by the Pittsburgh Wood Preserving Co., of Pittsburgh, Pa.

The contents are devoted to a description of the construction of wood block pavements by the method in which the sand cushion is eliminated and the blocks laid on a coating of bituminous cement spread on the concrete base, after which a filler of hot bituminous cement is poured over the pavement and into the joints. Besides the description of the method, the text includes extracts from reports and tests on this type of construction and letters from engineers and others indorsing the method.

The boklet is 8½x11 in. in size, and consists of 16 pages and double covers. It is illustrated by several halftones, two of which show completed pavements. The others show sections of pavements, blocks, and other details of the construction. The booklet is printed on heavy white paper in two colors, and is bound in double covers printed in red and black.

Notes

The Atlas Portland Cement Company has recently sent out an announcement from its general offices at New York to the effect that, until further notice, it will pay the war tax of 3% on freight charges for cement shipped from its mills.

The Walter A. Zelnicker Supply Co. of St. Louis, Mo., has recently secured the services of W. H. Bramman who is acting in the capacity of assistant to the president. Before he became associated with the Zelnicker Supply Co., Mr. Bramman was connected with the American Carbon & Battery Co.

The Blaw-Knox Co., of Pittsburgh, Pa., is distributing a small folder descriptive of the Blaw "Ransomixer." The outside of the folder carries an illustration showing one of the company's concrete mixers on a construction job, while the inside is devoted to a brief description of the advantages of the machine.

The Universal Portland Cement Co. and a number of other firms in Chicago, Ill., have decided to omit the sending out of Christmas and New Year's cards and will contribute the money saved in this way to war relief organizations. Letters are being sent out urging that other companies adopt the same plan.

The Duplex Truck Co., of Lansing, Mich., has announced that Herman Loeffler has become a member of the Duplex sales department, and will represent the company in the eastern states. Mr. Loeffler was connected with the Fairbanks-Morse Co. for ten years, and for the last three years has been associated with the Novo Engine Co., of Lansing.

The Good Roads Machinery Company, Inc., of Kennett Square, Pa., has recently issued as Bulletin K. D. S., a booklet describing the Economy snow remover. The booklet is 7x10¼ in. in size and consists of eight pages, including covers. The text comprises a description of the machine and its construction. The booklet is illustrated by a number of views of the machine, and is printed in red and black.

More motor trucks will be seen on the roads this winter than ever before, according to R. E. Chamberlain, manager of truck sales, of the Packard Motor Car Co. Mr. Chamberlain points out that merchants and manufacturers must face very serious transportation difficulties this winter and says that heavy duty motor trucks are now actually enabling many factories to remain at work. He predicts that during the coming winter trips formerly thought out of the question will have to be made over the roughest of roads and through snow, mud and ice.

The Terwilliger Equipment Co., of Philadelphia, Pa., has announced that on account of rapidly increasing business it has incorporated and moved to larger quarters at 2013 Market St. The officers of the company are as follows: President, E. M. Terwilliger; Vice President, H. E. Green; Secretary, John A. Conboy; Treasurer, W. George Brooks. Mr. Terwilliger formerly had charge of the Philadelphia branch of the Austin-Western Road Machinery Co. Mr. Green has been district manager of the Browning Company for the past seven years. Mr. Conboy formerly had charge of the mixer department of the Standard Supply & Equipment Co., and Mr. Brooks was, until recently, sales manager of the Packard Motor Car Co. of Philadelphia.

GOOD ROADS

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Number 21

Costs on Road Work by Prison Labor in Kanawha County, West Virginia

By A. D. WILLIAMS*

The all-absorbing question before the mind of every person interested in road construction is that of efficiency and cost. The abnormal labor situation and the question of transportation of materials and food supplies have placed every man interested in road construction at his wits' end to produce the greatest results. A fair test of what can be done with prison labor is shown by the report for nine months of State Prison Camp No. 3, in Kanawha County, West Virginia, under the supervision of Division Engineer P. J. Walsh. The accompanying tables show the average number of prisoners for each month, the total number of meals and the meals consumed by visitors, which include the guards and engineers.

The fourth column shows the total cost of food supplies per month. The fifth column shows the cost per meal. The sixth column shows the number of prisoners returned to the penitentiary for violating the honor rules. The seventh column shows the number of days of sickness.

It is interesting to note that the average for the entire nine months was 16 men. The average cost per meal was 13.4 cts. The total number of days' sickness for one man for the entire 9 months was 17 days, which shows the healthfulness of camp life under the proper sanitary rules. The prisoners were furnished to the county by the state authorities, the county bearing all expense, including transportation, board and clothes. The total cost of the camp and the operation of the prisoners for the entire period

FORCE OF HONOR MEN FROM CAMP NO. 3, KANAWHA COUNTY, WEST VIRGINIA—SHOWING MACHINERY USED IN CONVICT ROAD WORK

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*Engineer-Chairman, West Virginia State Road Commission.

ENGINEER WALSH SUPERINTENDENT MALOY AND CONVICT LABOR FORCE AT WEST VIRGINIA STATE PRISON CAMP NO. 3 IN KANAWHA COUNTY.

aggregates $13,611.77. This includes $400 of cement in stock, a mule team costing $600, three sets of harness at $75 per set, five heads of hogs at an average of $30 per head, and camp equipment estimated at $600 or a credit of $2,075. The total quantities of material moved upon the work, valued at the prices bid for a similar piece of work on the same road and adjoining work done by the prisoners, are shown in the second table.

TABLE I—DATA ON NUMBER AND COST OF MEALS AT STATE PRISON CAMP, NO. 3.

Month.	Average Number of Prisoners.	Total Number at Meals.	Meals to Visitors.	Cost of Food.	Cost per Meal.	Prisoners Returned to Pen.	Sick in Days.
Jan.	16	1,630	84	$158.94	$.0975	3	0
Feb.	15	1,412	68	186.01	.1317	0	2
March	14	1,480	91	132.82	.0898	3	0
April	15	1,566	108	180.19	.1151	0	0
May	14	1,583	134	201.03	.1270	0	0
June	13	1,528	152	273.54	.1790	0	5
July	12	1,507	266	205.75	.1360	0	3
Aug.	23	2,595	236	410.07	.1580	1	5
Sept.	21	2,326	231	357.35	.1536	1	2
Total		15,627	1,370	$2,105.70		8	17
Average	16	1,736	152	$233.97	$.1347		

TABLE II—VALUE OF WORK DONE USING UNIT PRICES OF CONTRACT LET ON ROAD OF SIMILAR CONDITIONS, SEPT., 1916, $16,778.26.

Quantities of Materials Moved:	
13,749 cu. yd. Unclassified, at 50 ct.	$6,874.50
5,082 cu. yd. Borrow, at 67 ct.	3,404.94
12,844 cu. yd. Overhaul, at 2 ct.	256.88
215 lin. ft. French Drain, at 25 ct.	53.75
231.92 cu. yd. Concrete Masonry, at $15	3,478.80
32 cu. yd. Reinforced Concrete Masonry, at $20	640.00
55.5 lin. ft. 18-in. pipe, at $1.75	97.13
194 lin. ft. 12-in. pipe, at 90 ct.	174.60
89 lin. ft. 6-in. pipe, at 29 ct.	25.81
608 lin. ft. 4-in. pipe, at 24 ct.	145.92
	$15,152.33
Extra Work	1,625.95
	$16,778.28

The total amount of money expended to Oct. 1 was $13,611.77. The extra work, amounting to $1,625.95, was calculated at actual cost. Therefore, after allowing the credits, the actual cost of the work by prison labor would be approximately 70% of the price bid in 1916, which amount is about 70% of the prevailing price bid for such work at the present time, which would make approximately 50% saving for prison labor over and above prevailing prices.

A careful analysis of the tables will demonstrate the value of prison labor in road construction. At the end of the calendar year a complete analysis of the figures will be made and published.

VIEW OF CAMP BUILDINGS AT CAMP NO. 3, KANAWHA COUNTY, WEST VIRGINIA—DIVISION ENGINEER P. J. WALSH AT RIGHT.

Bituminous Macadam by the Penetration Method*

By I. W. PATTERSON†

The word "penetration" when applied to bituminous macadam refers to the method of applying the bitumen. Instead of mixing the mineral aggregate with the binder, the binder is applied over the mineral aggregate, which has previously been laid and rolled to grade.

It is generally recognized that bituminous macadam by the penetration method is not a type of construction suited to the heaviest traffic, but its very common use upon outlying residential streets in cities and its more common use upon through trunk lines in rural sections are evidences that it has its merits in these locations. In New England at the present time more miles of improved state road are constructed of penetration work than of any other type of pavement. In a great many sections the first cost of penetration work is attractive as compared with the costs of other pavements and under proper conditions the ultimate annual cost is low.

There are no prevailing standards in the construction of penetration roads. The selection of materials and the processes of construction vary greatly. It is to be expected, therefore, that the results secured will vary greatly. In certain sections experience has shown that bituminous macadam roads are nearly worthless, but in these localities it is usually possible to find glaring errors either in the materials selected or in the construction methods.

In discussing construction methods the speaker will adhere very closely to practical features which, to his mind, are very important and which frequently are not given sufficient attention.

The preparation of the subgrade for a bituminous macadam pavement is a very important operation. It is safe to say that over one-half of the failures of penetration work are due to faulty subgrade work. A penetration pavement is more susceptible to failure by reason of subgrade troubles than are many other pavements. The reason for this susceptibility is explained in many ways, but it seems logical to attribute it to the inability of the pavement to withstand upward pressure locally applied by frost action and to the unavoidable large percentage of voids which have a weakening effect.

Penetration work gives the best results when laid over a freely permeable soil. Sand and gravel are ideal subsoils. A heavy soil of low permeability is, as a rule, disastrous to penetration work in this latitude unless special precautions are taken. In our state road work an insulating layer of sand or gravel beneath the pavement is always employed where the existing soil lacks the requisite degree of permeability. A fill of wall or field stone is substituted for the gravel or sand where subdrainage and foundations are both required. The drainage of certain soils is not, as a rule, sufficient in penetration work. The replacing of undesirable soils for a depth of from 6 in. to 2 ft. below the pavement proper with sand or gravel appears to be the most satisfactory method.

The methods usually employed in shaping up and rolling subgrades for pavements are sufficient for penetration work. Disastrous mistakes in subgrade work are not as a rule due to faulty grading or faulty compression, but are usually due to errors of omission in dealing with heavy soils.

Where grades are established and cannot well be changed, as is the case in cities, it is necessary to borrow sand or gravel for use as an "insulating" layer. In rural districts, however, unless the soil encountered is uniformly too impermeable, the expense of an insulating cushion may be made very low by so establishing grades that sand or gravel encountered in excavation is used to advantage over impermeable soils. Since payment for grading is made on excavation only, little additional expense may be occasioned.

Too much emphasis cannot be laid upon the importance of a most careful study of the sub-soils encountered in penetration work. A section which contains nothing but impermeable soil, as does the island of Rhode Island, presents a very simple problem, but where the character of the soil changes at frequent intervals, as is the case in many sections of our state, the task of taking care of soil conditions is difficult.

The nature of the rock used for penetration work, the sizes to which it is crushed and the methods of laying the crushed stone are interesting and important features.

Tests of rock, according to existing standards, are valuable for the purpose of showing its hardness and toughness, but certain characteristics of the rock not included in the generally accepted list of rock tests for road work make undesirable the basing of opinions solely upon these tests. A rock which has been badly sheared, for instance, may show up well in the standard tests, but yet in practice prove far from satisfactory by reason of its tendency to break badly in the rolling process and its inability to form a good mechanical bond because of the prevalence of large numbers of smooth faces broken on the shear planes. The adherence of bitumens to rock is a feature which tests are rather weak upon. A smooth fracture is not conducive to success. It also occasionally happens that a stone which tests well is rendered far from satisfactory in practice because of the adherence of very fine stone dust to the surfaces of the individual stones after the crushing operation. In general, rock to give good results in penetration work must be hard and tough, must present rough fracture faces, and must go through the crushing operation without adherence of rock powder. A soft, inferior stone almost invariably gives a smoother, better appearing surface for about one year after construction. If, however, a road built of soft stone carries an appreciable amount of traffic, waving and raveling, as a rule, begin during the second year and increase rapidly.

The sizes of crushed stone to be used in penetration work is a subject which is much debated. In the earlier days of penetration work it was almost uniformly the practice to employ stone varying in size approximately from ¾ in. to 1½ in. for the penetration course. At the present time the tendency is toward larger stone. Our state specifications call for stone from 1½ to 2¼ in. A smaller stone invariably surfaces up quicker and makes a better appearing job at the start than does larger stone, but the tendency of small stone is to wave under traffic and to wear unevenly because of uneven penetration brought about by the segregation of the various sizes passing the screen. With stone from 1½ to 2¼ in., segregation of the smallest sizes and of the largest sizes passing the screen is not apt to happen and is not serious if it does happen.

It is sometimes the practice to lay the stone for penetration work in one layer. If the work consists merely of resurfacing water bound macadam so that the thickness of the new stone to be penetrated is not over 3 in., this can be done safely. If, however, the total depth of crushed stone is to be 6 or 8 in. after compression, as is usually the case in new work, it is not desirable to lay the stone in one course. The reasons for this are that the proper compression cannot be obtained, with the result that a disastrous internal movement under traffic is inevitable, and also that much of the bitumen is wasted by penetrating deeply into the layer of stone. The best practice seems to be to lay the stone in two courses, the first course being sand filled, well compacted and laid parallel to and 2½ to 3 in. below grade. It is our practice in Rhode Island to use the same sizes of stone in both courses.

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*Paper presented before the Providence Engineering Society, Providence, R. I., October 24, 1917

†Chief Engineer, Rhode Island State Board of Public Roads.

The extent of rolling the penetration course of crushed stone previous to the application of the binder is specified in many ways. It is frequently stated in specification that this course shall be rolled only enough to set the stones in place, the intention apparently being to prevent rolling to the extent of breaking the stone with the result that the course is tightened too much to allow of free penetration. With the sizes of stone used in our state work, provided the quality is as it should be, it is the speaker's belief that it is preferable to roll until there is no appreciable movement under the roller, thereby securing, before application of the binder, the maximum mechanical bond. We follow this practice in our work and have yet to perceive an instance where free penetration is prevented thereby

It is, of course, apparent that no earth work should be carried out upon the sides of the road while the top course of stone is being prepared, because of the possibility of dirt being dropped upon the stone, with the result that the surface voids are closed. It is also necessary to instruct the roller engineer to prevent ashes from dropping from the ash pan of the roller upon the stone.

It must be kept in mind that the time to remedy inequalities in the surface of the penetration course of crushed stone is before the binder is applied. The riding qualities of the finished road depend very largely upon the spreading of both the bottom course and top course of stone. It is, of course, more difficult to obtain an even surface with coarse crushed stone than it is with a fine, mixed aggregate, but the finished result accomplished by experienced labor is not appreciably more uneven.

The application of binder is an operation which must be carried out with great care. There are numerous contrivances for this purpose on the market, ranging from simple hand pouring pots to very complicated motor-driven distributors. With expert, experienced labor, very good results may be accomplished by hand pouring, but, as a rule, work done by this method lacks uniformity to an extent which affects more or less seriously the riding qualities of the road. In our state work we have secured the best results with a distributor of the pneumatic pressure type, mounted upon a drum of the same width as the distributing device and hauled by a steam roller. This machine has a very small capacity and is not economical for use with a soft binder which can be handled from tank cars. Heating kettles are set up beside the work, and in all cases distribution progresses each way from the kettles, the rolling being taken care of in running back and forth to the kettles.

The amount of binder to be used in the penetration distribution depends upon the size of stone used and upon the character of the binder. With 1½-in. stone in the penetration course and with a tar binder or light asphaltic binder, a maximum of 1½ gal. per sq. yd. of surface should be used for the penetration application. In our state work a larger stone and a heavier binder allow us to use approximately 2 gal. per sq. yd. of surface.

The stone must be dry when the binder is applied and a void filler of small dry crushed stone should be spread as soon as possible after the distribution is made. The fine crushed stone to fill the voids is, as a rule, clean ½-in. or ¾-in. screenings. It is sometimes the practice to use sand for a filler, but the speaker deems it preferable to employ a small crushed stone in order that the surface be left porous so that the seal coat will run in around the filler and make, in effect, a concrete mixture.

Rolling should be started as soon as possible after the void filler is applied. The extent of rolling depends upon the weather conditions and upon the temperature. In our specifications we do not attempt to specify the rolling, this feature being left to the discretion of the engineer. It is the speaker's belief that few types of construction depend for success so largely upon the rolling. With a suitable stone it is practically impossible to roll the pavement too much. It is, however, very necessary to use judgment in the times of rolling. The initial rolling after application of the binder should be carried out immediately after the spreading of the void filler. Subsequent rollings depend largely upon temperature and weather conditions. It is not desirable to roll during rainy weather, and later rolling is more efficient when done at the time of day when the temperature is highest, especially early and late in the construction season.

The spreading of the void filler has considerable effect upon the finished result. Uniformity in spreading is very important. It is not desirable to apply the void filler in amounts greater than are necessary to fill the voids. It is, furthermore, necessary to prevent the existence of patches where the filler is lacking or is insufficient to fill the voids. It is, as a rule, policy to continue the spreading of screenings during the rolling process rather than to complete their spreading before rolling. The use of wire push-brooms is, as a rule, necessary to even up the screenings and to avoid excessive amounts in spots. Exceptionally skillful labor may, however, make their use unnecessary.

In the South, seal coats at the time of construction are frequently omitted, but in this latitude their application is very important. The seal coat is applied after the void filler is spread and after the rolling of the penetration course has been completed. In our state work we usually plan to apply the seal coat in from three to five days after the first penetration, rolling of the penetration course being carried out each day intervening. Before the seal coat is applied it is necessary to inspect the surface carefully and to sweep off any dirt or foreign matter which may have been deposited upon the surface and to secure the greatest uniformity in the void filler. The amount of binder to be used for the seal coat depends upon the size of the void filler used and upon the nature of the binder. If the void filler is coarse so that the binder can run down between the individual stones of the filler to some extent, the amount to be used may, of course, be increased. In our work ¾ gal. per sq. yd. is a minimum and 1 gal. per sq. yd. a maximum. Uniformity of distribution is of greater importance in the seal coat than is the penetration distribution. Local excess of binder is certain to cause what is termed a "fat spot," which interferes seriously with the riding qualities.

The seal coat must, of course, be covered with screenings or sand as soon as possible after its application. Screenings appear preferable where heavy binders are employed, although sand gives good results over light binders, especially over tars. It is not desirable to spread the screenings so that an appreciable surplus exists, because of the dusty, muddy condition which results to the inconvenience of the public and to the detriment of the road occasioned by the retention of moisture upon the surface.

It is not sufficient merely to smooth up the surface with a roller after the covering of the seal coat is completed. It is desirable to continue rolling for several days after the road is complete. This back rolling should be done in the middle of the day, when the heat makes the binder plastic, in order to be of the most value. The surfacing process is greatly aided by back-rolling. A penetration pavement is at best very slow in surfacing, but this process is greatly aided by rolling, even after the road is open to traffic. Where large stone is used in the penetration course, insufficient rolling causes the road to present a rough, mosaic appearance for a long period and to remain porous much longer than is necessary. A penetration pavement is not ordinarily wholly waterproof at the beginning. The surfacing process is really a compacting process under the action of travel, and after this process is complete a well built penetration pavement is waterproof.

The success of penetration work is affected more by the time of year it is done than in the majority of pavements. Until the surfacing process is complete, the pavement is not in condition to pass through the winter safely. Much is said about the effect of low temperatures at the time of construction upon the success of penetration work. It is the speaker's belief that the temperature prevailing at the time of construction is not as important as the length of time intervening before cold weather sets in permanently. A cold snap late in the spring or early in the summer seldom produces serious results upon work done at that time, but work done when the temperature at the time of distribution is fairly high is handicapped seriously if the work is done late in the fall. The amount of travel has a direct bearing upon the time necessary for surfacing, sc a definite statement as to the time limits for doing penetration work safely is not wholly reliable. In general, it is highly desirable in this climate to close all penetration work about October 1. Work done later in the season, as a rule, presents the following spring a pronounced mosaic appearance, which indicates that the surfacing process was inferior. Low temperatures, of course, make impossible the plastic condition so desirable to secure the best results of back-rolling and under travel.

There are, as the speaker has said before, great differences in the details of constructing penetration roads. One rather common method which varies from the method described is the triple penetration method. In this process small crushed stone is used for the penetration course. A part of the penetration course is spread, rolled and penetrated; the remainder of the course is spread and penetrated, and a seal coat is applied. The idea entertained by those who favor this plan is that the asphalt is better distributed through the penetration course by applying it in two courses. It is rather difficult in this plan to secure an even surface, because the top layer of the penetration course must be spread very thin, and a thin layer of crushed stone is rather difficult to lay to grade. The possibility of "fat spots" occurring is also greater in this method. The speaker is unable to perceive any advantage resulting from triple penetration work.

The tar-sand grout method is strictly penetration work. This method is common in England, but has had a very limited use in this country. Under this method, tar and sand are mixed together in a mixing trough or box, and the mixture grouted into the crushed stone. It is claimed that this method produces a pavement which is not as slippery as other forms of penetration work.

Penetration work is not difficult to maintain. Patching is readily done without expensive equipment. Resealing of penetration work is a sort of last resort to be employed when the patching cost is so heavy that the need of a seal coat is felt. The speaker is not in favor of seal coating at frequent intervals, as is done in some localities. Frequent applications of seal coats are very apt to cause the accumulation of bitumen upon the surface to such an extent that waving results to the serious detriment of the riding qualities of the pavement.

The first penetration work done by the Rhode Island State Highway Department was in 1907, when a very short experimental section was built. This section was not a success for a number of reasons which were not apparent when the work was done, but which are evident from later experiments. This section is still serviceable, however, and doubtless will be in use for many years.

In 1913 considerable penetration work was done. To date none of the work done in 1913 has required resealing and all indications point to the wearing of these sections for several years before a new seal coat is required. The patching has been so light upon this work done in 1913 as to be almost insignificant. Waving, due to the use of a smaller stone in the penetration course than is now used, is somewhat in evidence, but is not as yet so pronounced as to be serious.

It is the speaker's belief that penetration work is not suited to heavy, horse-drawn traffic and is not suited to use upon the main streets of the larger villages. As a pavement for trunk lines in rural sections, however, it has proved serviceable in our experience with it. If suitable sand and gravel are available locally for bituminous concrete work, modern machinery for mixing may make possible the construction of a bituminous concrete pavement at a cost no greater than the cost of penetration work. Under such conditions penetration work should not, in the speaker's opinion, be selected.

There has been for years a tendency to build more expensive pavements upon trunk line roads. It is reasonable to predict that in the near future the pavements laid generally upon trunk line roads will be of a similar type and fully as costly as the pavements employed in cities today. When this time arrives, penetration work will be relegated to rural roads of secondary importance. Before permanent pavements are the rule rather than the exception upon trunk line routes, the public must be educated to expenditures for state roads far beyond what they dream of today.

Report on Road Work in Alabama

The number of miles of highway of all classes built in the State of Alabama during the year ending April 1, 1917, was 1,549.72, according to the annual report of the State Highway Commission, which covers the operations of the commission for the year and also contains a summary of its accomplishments since it was created in April, 1911. The report, which is issued under date of Aug. 27, 1917, states that, notwithstanding conditions brought about by the entrance of our country into the war, the indications are that the present year will be an unusual one for road construction in Alabama.

The mileage of state aid roads, 99.22, built during the year covered by the report shows a decrease as compared with the two previous years, attributable in part to the lack of finances on the part of the state. Changes in boards of revenue, county commissioners and probate judges in the various counties, and the fact that nearly all of the 30 counties applying for federal aid withheld their requests for state aid in 1916 in order to use it in 1917 in conjunction with federal aid, are given as further causes which undoubtedly delayed the undertaking of new projects.

State aid highway construction cost the state and the counties aided $176,158.52, including bridges costing $16,300.52. Outside of state aid, the counties expended on the construction of 1,450 mi. of improved roads and bridges $3,447,131.88.

The expenditures by the counties for road maintenance during the same period amounted to only $212,458.32. In commenting upon this feature of highway work in Alabama, the State Highway Commission stated that the most difficult, and the only unsatisfactory, task of the department was securing the proper maintenance of roads after they had been built.

The total amount spent on roads and bridges in the state during the fiscal year of 1916 was $3,853,748.03. The counties' share of the state highway fund was $82,523.72.

Of the public road mileage of Alabama, 56,396, about 17% or 9,536.80 mi., are improved. In April, 1911, when the commission began its work, there were only 3,780 mi. of improved highways in the state, so that the present improved mileage represents an increase in six years of upwards of 150%.

The amount of federal aid available for Alabama on July 1, 1917, was $312,446.70. The state being unable to provide an equal amount, the commission appropriated $10,000 of federal aid funds to the first 31 counties requesting federal aid and contributing a like amount. When the report was issued, applications had been received from 30 counties which it was expected would fully meet the requirements of the law.

The types of roads constructed with state aid during the year ending April 1, 1917, were gravel, sand-clay, graded and chert. The mileage of gravel constructed was 38.11, the sand-clay and graded types being about equal, and the chert construction representing a mileage of only 7.04. Sand-clay predominated in road improvement by the counties, though almost equaled by the number of miles of graded road built, with about half the number of gravel, a small percentage of chert, and a few miles of macadam and shell.

The detailed account of state aid work done in the various counties shows that in Clarke County, where 5.55 mi. of sand-clay road, 14 ft. wide, were built on a roadbed 22 ft. wide, the cost per mi. was $1,536.63. The work was done by contract. In Houston County 4.66 mi. of sand-clay, 16 ft. wide, were constructed by county forces at a cost of $1,470 per mi., while in Pickens County, 9 mi. of sand-clay, 14 ft. wide, averaged $1,286.71 per mi.

A 12-ft. gravel road in Franklin County measuring 3.968 mi. in length was built by the county organization at a cost of $2,341.47 per mi. In Limestone County a 14-ft. gravel highway, 3.6 mi. long, cost $1,409.39, while a 22-ft. gravel surfacing was laid by county forces in Madison County at $1,900 per mi. Talladega County built 14.7 mi. of 12-ft. gravel for $1,623.80 per mi.

Graded road in Marshall County, covering a distance of 5.11 mi., was constructed at an expense of $1,604.78 per mi. and a 20-ft. road in Morgan County averaged $3,179.32 per mi. About 7 mi. of 12-ft. chert road in Etowah County, was constructed by the county under the direction of the county engineer, for $1,594.95 per mi.

Ohio Road Organization Urges Importance of Road Building and Representative of Motor Truck Industry for Highways Transport Committee

Through its trustees, the Ohio Good Roads Federation has taken up the matters of road building during the war and the placing of a representative of the motor truck industry upon the Highways Transport Committee recently created by the Council of National Defence.

The trustees of the Ohio organization met at Columbus, on Nov. 13 and passed the following resolution in reference to public roads as a war necessity:

WHEREAS: The conditions created by war have made the Federal Government the largest user of available transportation facilities in addition to those required by agricultural, industrial and commercial demands; and

WHEREAS: Such available transportation facilities are unable to meet the present combined demand of the Government and private enterprise upon them; and

WHEREAS: For reason of these added burdens our present transportation facilities are sure to be the limiting factor in general business, thereby lessening both the earning power of our citizenship and their industrial efficiency; and

WHEREAS: The railways of the country admit their inability to cope with the dual demands upon them and the danger attending such decrease of transportation service, which may bring, not only suffering upon the people but a possible catastrophe to the nation by reason of its helplessness to transport those things needful for use upon the farm, in the mill, the factory, the store and the home; and

WHEREAS: The public highway is recognized as an instrumentality of incalculable value to the nation for transportation purposes, and is the one great agency to which we must now turn as the means for exchange of the products of the nation's industry;

THEREFORE, WE RESOLVE: That we view with alarm the policy of stopping the improvement of public highways, as a non-essential enterprise, when it is apparent that the public highway is the single unit of our transportation system upon which alone private enterprise of every character may have to depend for its very existence; and

WE FURTHER RESOLVE: That instead of curtailing the improvement of highways we earnestly urge their development as primary factors of immediate concern for preserving and safeguarding the present posperity and stability of the nation in its struggle for the preservation of human liberty; and

WE FURTHER RESOLVE: That we commend the National Council of Defence for recognizing the vital relationship of all transportation agencies, their untiring efforts to secure a correlation of usefulness; and a higher degree of efficiency in all transportation problems. To this end we approve of the appointment by it of a committee on highway transportation, believing that a greater degree of development will come out of a more comprehensive knowledge of the whole subject and its interdependence; and

WE FURTHER RESOLVE: That we favor the prompt adoption by the Federal Government of a general plan for the immediate improvement of those roads of national importance, based upon their commercial or military value, and that we urge Congress to appropriate federal funds for that purpose, to be expended under a permanently constituted federal highway commission, leaving to the states and their sub-units the task of improving those roads of primary state usefulness; and

WE FURTHER RESOLVE: That in consideration of the vital importance of road improvement to the nation's welfare we urge that road building material be given a priority classification by federal authorities, so that states and counties may complete unfinished projects, and disconnected sections of roadway serving communities may be joined together, thus making road expenditures both a local and a national asset of inestimable value for preserving the stability of private enterprise and for obtaining a greater mobility of national resources for the prosecution of the war.

WE FURTHER RESOLVE: That, in view of the inability of the railroads to afford adequate transportation facilities for war and domestic needs, the "Committee on National Affairs" of the Ohio Good Roads Federation be authorized to suggest and aid in formulating a general constructive program of highway improvement embracing all units of government, which will be wholly essential in preserving the agricultural, commercial and military needs of the nation; and to this end, the Committee on National Affairs is hereby authorized to cooperate with the Highways Transport Committee of the National Council of Defence; and that copies of these resolutions be sent to the members of the Committee on Highway Transportation, of the National Council of Defence, Governor of Ohio, United States Senators, and Congressmen, the State Highway Commissioner, members of the Highway Advisory Board, county officials, county chairmen, officers and members of the Federation.

At the same meeting the matter of a representative of the motor truck industry on the Highways Transport Committee was taken up. As a result of the discussion, a resolution was adopted stating, in effect, that while the federation was heartily in accord with the purpose for which the Highways Transport Committee was appointed, it felt that the motor truck industry should have a representative on that committee. It was pointed out that this industry could largely assist in solving the freight congestion problem and that one of its representatives on the committee could be of inestimable value in assisting that committee in the accomplishment of the purposes for which it was appointed.

Texas to Expend Large Sums for Road Work Next Year

According to a recent statement by Curtis Hancock, Chairman of the State Highway Commission of Texas, upward of $40,000,000 will be spent on the roads of that state during 1918. Of this amount $2,500,000 represents revenue from motor vehicle registration, $4,500,000 the state apportionment of federal aid, and the balance the amount to be spent by the counties.

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Articles by road builders are solicited. They should be short and, if possible accompanied by photographs. Those accepted will be paid for at current rates.

November 24, 1917

THE EMBARGO SITUATION

The order forbidding the use of open-top freight cars for the shipment of road materials we believe to have been unjustifiable from any enlightened point of view. Our reasons for this attitude were set forth at some length in the issue of November 3, and since that date we have had ample evidence that "Good Roads" voiced the sentiments of its readers in its comment under the caption "An Ill Considered War Measure."

This journal is for America first, last and all the time. It is for the war and for winning the war, winning it so thoroughly that there will remain nowhere any doubt that it is won nor who the winner is. It is also for winning as speedily as possible.

Because "Good Roads" is for these things, it is also for road building. The building of roads and the up-keep of those already built are going to be big factors in the struggle we have entered and made our own. All the work of winning the war cannot be done "over there." The actual fighting can be, we hope; but a no less vital part of the struggle must be staged here. The fields, forests and mines of America, her factories and shipyards, her railroads, waterways and highways, must all play their parts. And the part that makes all the rest possible is transportation.

Whatever of competition has existed between the roads and the railroads must end. They must be used together, one supplementing the other, to move raw materials, manufactured products, food. And, most essential of all, facilities must be furnished for the transportation of those things needful for keeping fit and at their maximum of efficiency the means of transportation.

There seems to be little hope of the immediate lifting of the partial embargo upon road building materials, although strong representations have been made to the authorities at Washington. At the same time, we are advised, the officials are beginning to see the light. With the aid of those to whom appeals have been made and who have been convinced of the importance of roads, and with the cooperation of the Highways Transport Committee of the Council of National Defence, road builders should be able to look forward to the 1918 season with the hope of being able to do their bit without hampering restrictions from those who should render all the aid within their power.

CONVICT LABOR FOR ROAD WORK

There is nothing new in the idea of utilizing convicts in road work. They have been used for that purpose for a long time and often for projects of considerable magnitude. Usually such work has shown a profit in dollars and cents, all things considered; and it is certain that from the broader viewpoint that takes in the benefit accruing to the prisoners and to society as a whole convict labor has been a success.

Probably the chief obstacles in the way of a more extensive use of convicts have been prejudice and inertia. There has been a certain amount of short-sighted opposition from free labor because of fancied danger of competition. There has also been manifested a foolish fear by people who felt that evil results of some sort might come from working prisoners in sight of the public. On the part of the authorities there has existed the usual hesitancy about making innovations. The result of this last has been the retention of the crude, ineffective and unenlightened penal methods, so long followed in even those communities supposedly the most advanced.

To these difficulties have sometimes been added the obstructive tactics of those who were making profits on the labor of convicts. In some places the contract system long stood in the way of utilizing convict labor on roads and other public works.

Under the combined influence of agitation for more and better roads and the efforts of prison reformers these opposing forces have been measurably weakened in many communities, and prison labor has been employed to an increasing extent. Under existing conditions in the labor market there is every reason to look for a still greater use of prisoners. There are not enough convicts to make up the difference between the number of laborers needed and the available supply, but there are enough of them to perform at least a part of the most necessary work. That they can be used effectively and in an economical manner, at least in some parts of the country, is shown by the cost data on work in Kanawha County, West Virginia, presented in an article printed in this issue.

Additions to the available forces could be made by using enemy aliens. This has already been proposed in these columns. As time goes on and it becomes more and more apparent how dangerous these aliens are, the wisdom and feasibility of some plan for utilizing them seem more and more evident. They will constitute a menace to the country so long as they are allowed any freedom of movement, and there is no reason whatever for maintaining them in idleness.

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Concerning the Use of Convict Labor on Highway Work in the United States "The Surveyor," of London, England, makes the following comment: "Could we not follow this example, although in a somewhat different manner, as it appears that these 'foremen, or guards, are armed with shotguns to compel the laborers to stick to their jobs, about two guards being required to a gang of twenty men'? Is it not to be feared that such drastic, though probably necessary, measures would be discountenanced by our soft-hearted legislators in this country"?

Plans for Using Local Materials in Pennsylvania Road Work

A series of inspection tours for the purpose of ascertaining which of the improved roads of the state will have to be repaired next year, and whether or not local material can be secured for the work, was recently initiated by State Highway Commissioner O'Neil, who, accompanied by Chief Engineer William D. Uhler, made a three-day motor trip through Lebanon, Berks, Lehigh, Northampton, Monroe, Lackawanna, Luzerne, Columbia, Montour and Northumberland Counties.

On account of the embargo on freight cars for carrying road materials the State Highway Department has arranged for a number of conferences with county commissioners in order to work out a progam for next year, if possible, whereby certain roads can be constructed on a cooperative basis, the county and state each bearing half the cost.

Concrete Road Repairs in Wayne County, Michigan

The following method of repairing concrete roads is used on the highways of Wayne County, Michigan, according to the annual report of the Board of County Commissioners:

"Equipped with a tar kettle, several wire bristle brooms, a wheelbarrow, a couple of shovels, a tar bucket, and sprinkling cans, a team and a small crew of men are an adequate force for doing this work. Cracks and spalled joints are swept clean with the wire brooms, after which tar, heated to 225° F., is poured into the clean crack and allowed to stand for a few moments to prevent it from bubbling. Clean, coarse, dry sand is then spread on the tar from a shovel. Any pit holes are given the same kind of treatment. A slight excess of tar and sand is used, so that traffic will eventually iron out the application.

"Practically all communities having concrete roads have followed the methods of maintenance which we have developed. A grade of tar, known under the trade name of Tarvia XC, is used.

"If an imperfection that does not extend through the pavement, yet is over an inch deep, is to be treated, the cavity is thoroughly cleaned out. It is then dried, painted with hot tar, and filled with stone of suitable size so graded that the bulk of the stone will have voids reduced to the lowest possible point. This filling is then firmly tamped or rolled into place. On top of this patch hot tar is poured, the quantity being so regulated that it will be enough to fill in voids remaining in the pebbles or stone and leave but a slight excess on the surface. Dry sand is then spread on this excess and traffic irons it down as in the case of similar repairs to joints.

"One maintenance crew will do all necessary work on from 1 to 3½ mi. of concrete road surface a day. Where we have occasion to repair holes that are two or more inches deep, we clean them out thoroughly, cutting away the concrete so as to give truly vertical sides to the hole, paint the edges with a cement grout, and fill the cavity with a concrete mixture proportioned as was that used in the original construction. The repaired portion is protected from traffic until thoroughly hardened, and hardening is accomplished by keeping the repaired spot covered with a moist layer of earth, kept moist by frequent sprinkling for at least seven days.

"In addition to the foregoing, weeds are kept cut; the ditches and drainage structures cleaned out both spring and fall to afford a free flow of water; guard rails and bridges, painted and repaired, and all other necessary items are taken care of to keep our highways up to their highest point of efficiency, prolong their usefulness and make them safe and sightly. We have continued to drag our roads during the winter months to keep the snow leveled down, thus making them safer for travel and distributing the wear over a greater area of roadway."

A Letter from Col. Crosby

The subjoined letter from Lieutenant-Colonel W. W. Crosby was received by Secretary E. L. Powers of the American Road Builders' Association in reply to a communication notifying Colonel Crosby of his election as first vice president of that organization at the annual meeting on November 2. It is printed here to comply with Col. Crosby's wish that his thanks be extended to A. R. B. A. members and also because it is felt that the letter will be of interest to his many friends and acquaintances among the readers of "Good Roads." The letter follows:

HEADQUARTERS 104TH ENGRS., U. S. A.,
Camp McClellan, Anniston, Ala.
10th of November, 1917.

E. L. Powers, Secretary,
American Road Builders' Association,
150 Nassau St., New York City.

My dear Mr. Powers:

Yours of the 7th inst. just received. I am very grateful indeed to the members of the A. R. B. A. for the honor they have done me in electing me to the office of first vice president, and I would like them to know it if possible. It is an honor to hold this office in such an association, with a membership made up as ours is of men who are leaders in the nation, if not of the world, in one of the most important spheres of action now-a-days—the improvement of highways—and I deeply appreciate it.

I wish I might look forward to being of more value and help to the association than prospects at the present time seem to warrant. I fear that circumstances will interfere with my returning to the members a proper "quid pro quo" for their generous action. The facts are that we here are getting ready as fast as we can for an early departure for the front, and that the date when any of us will again be in position to take up matters of importance in civil life is absolutely indefinite.

When we shall get away is unknown, to us at least, to say nothing of when we shall return. We can't even speculate on these points. Our days are too full of more pressing matters of immediate concern, such as getting our equipment, training ourselves and our men, perfecting our organization, keeping warm these cold nights, and getting outside of three very square meals each day—to say nothing of trying to find time for keeping in touch by correspondence, at least, with at least one "girl left behind," and for a reasonable amount of sleep every twenty-four hours.

It all keeps us pretty busy, but most of us seem to be thriving on the work and food. We have a fine camp, and so far have had the most beautiful weather almost constantly. And I think that in spite of many and various obstacles we have made progress, but there is yet a lot to do.

The 104th Engineers is composed mainly of men from New Jersey, though there are some from Delaware and Maryland. Our old acquaintance, F. A. Reimer, from Orange, is one of the majors. The regiment is newly organized. When I took command of it in the absence of the colonel (who was in the hospital) there were but 450 men in it, but before the colonel arrived I had some 1,300. Now it is full, and our numbers are nearly 1,700. The colonel is C. W. Otwell, an officer of the Regular Army (Engr. Corps), a most competent man, and a fine chap. We expect eventually to have it one of the crack outfits. It is not to be one of those specialized units, but just a regular pioneer or sapper outfit, which forms a part of the divisional organization, and attends to everything that engineers are called upon to do from making maps and building bridges to putting in trenches, barbed wire entanglements, laying mines, operating searchlights and other means of battlefield illumination, and launching flame and gas attacks. So you will understand why we have a lot to learn and practice, and why we are busy here. It is all very interesting and inspiring, and I have but one regret at present. That is that I cannot see my old friends once in a while. Those of them whom you see I wish you would give my kindest regards to, and tell them that they are by no means forgotten, even if they do not hear from me directly. I hope they all are well and enjoying life to the utmost. Let me hear from you when you can, and tell me about both affairs and individuals.

With best wishes, believe me,

Sincerely yours,
(Signed.) W. W. CROSBY (Lt. Col.)

Bell County, Texas, Will Vote on a Bond Issue of $1,900,000

An election has been ordered by the Commissioners' Court of Bell County, Texas, to give the people a chance to decide the question of issuing road bonds in the sum of $1,900,000. The election will take place Dec. 10.

The issue is desired to take up $1,206,000 of the present road bond issues against the various districts of the county, to provide $400,000 for distribution among the four precincts for the construction and maintenance of roads, and to take up outstanding deficiency warrants amounting to $294,000.

Street Accidents in New York City

Figures compiled by the Police Department show that 67 persons were killed and 2,327 were injured in street accidents in New York City during Oct., 1917. While the number is below the accidents occurring in Oct., 1916, the latter were unusually large owing to strikes on street railways.

The number of persons killed and injured by vehicles in October of this year were, respectively, as follows: Automobiles, 19, 755; motor trucks, 11, 267; horse-drawn vehicles, 5, 104; street cars, 9, 166.

Contributory causes of a number of deaths and injuries are given as stealing rides on street cars, falling from cars, and collisions.

New Jersey Road Work Planned for Next Year

A report on the state highway system of New Jersey, comprising fifteen routes and their alternatives, has been submitted to the State Highway Commission by Maj.-Gen. Goethals, State Engineer.

The report shows the work that has been done in the matter of surveys which has been retarded by lack of engineering services due to the war. It is expected that a report giving in detail the estimated costs of proposed improvement of the various roads will be completed within a few weeks.

The State Highway Commission will operate under a direct state tax, which, according to report, will make available the sum of $3,165,000 for the first year's work, with an additional $2,000,000 from automobile registration to be used by the counties in repairs. With the exception of the military roads in the vicinity of Camps Dix and Merritt, construction work contemplated in the above report will not be undertaken before April 1, 1918.

Six Roads in New Jersey to Be Paved

Plans are being made for repaving six county roads in Essex County, New Jersey, of a combined length of about 13 mi. The cost of improving the roads is estimated at about $680,200. No appropriation has been made for the work, but an outline of the proposed improvement is to be submitted to the State Highway Commission with the expectation of receiving state aid. The early preparation of a county road program, to be undertaken after the completion of the present schedule, will give the commission ample time, it is stated, in which to investigate the projects.

The roads proposed are as follows:

Bloomfield Ave., from the Montclair line through Verona, and Caldwell to Dutch Lane, 4.2 mi.; granite block on concrete; estimated cost, $390,000.

Avondale Road, from Washington Ave. to Nutley Bridge, 1,600 ft.; granite block on concrete; estimated cost, $21,300.

Rutgers St., from Washington Ave., Belleville, to Belleville Bridge, .25 mi.; granite block on concrete; estimated cost, $20,300.

Stuyvesant Ave., Irvington, from Newark line to Union County line; 2.125 mi.; bituminous concrete; estimated cost, $95,200.

Gregory Ave., West Orange, from Luddington Road to Mt. Pleasant Ave.; 1.25 mi.; bituminous concrete; estimated cost, $75,800.

Watchung Ave., from Upper Montclair Ave., Montclair, to East Passaic Ave., Bloomfield, 2.5 mi.; bituminous concrete; estimated cost, $77,600.

Excessive Bids for Pennsylvania Road Work Rejected

The high prices recently bid for the construction of roads in Allegheny and Somerset Counties, Pennsylvania, resulted in the rejection of all bids. The work will be readvertised.

The contemplated improvement in Allegheny County begins at a point north of Perrysville and extends through Ross and McCandless Townships to a point about ½ mi. north of Pine Creek Crossing, a distance of 21,426 ft., or nearly 4 mi. The highway to be improved in Somerset County is 7 mi. long. It is located on State Highway Route 269, and extends through Lincoln and Jenner Townships and Jennertown Borough. Only two bids were submitted for this work. The type of construction proposed for the roads is reinforced concrete or bituminous concrete.

Another Suggestion for the Employment of Enemy Aliens

Highway authorities throughout the United States, on whom rests the responsibility for the up-keep and maintenance of roads used by the military forces of the country, will probably indorse the views of State Highway Commissioner Babcock of Minnesota in regard to the maintenance of such roads and the authority of the Secretary of War to interest his department in this matter. According to Mr. Babcock:

"The condition of some of the roads leading to, and in, the Fort Snelling Reservation gives some idea of what highways must be at the large cantonments. It is not fair to ask the state highway departments to attend to all maintenance and meet maintenance costs in these cases.

"The suggestion has been made that the War Department be given authority to put its engineering corps on the job where intense traffic is making roads nearly impassable. Instead of allowing Germans interned in this country to live in luxury and ease in northern internment camps, why not put such of them as are able to work on the nation's roads? The same use could be made of Germans captured by the American troops in France. If they are sent back here on transports perhaps their countrymen will not be so ready to sink transports, homeward bound at least."

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A Significant Result of the Election in Cook County, Illinois, is that all proposals to bond the county for public purposes were lost except the $1,000,000 issue for improving the highways.

The Scranton Good Roads Association, of Pennsylvania, is agitating the question of utilizing the abandoned roadbed of the Delaware, Lackawanna & Western Railroad between Clarks Summit and New Milford in that state, which the state has authority to take over for the construction of a permanent highway. It is said that the cost of transforming the roadbed into a highway would be comparatively low.

To Prevent Damage to Paved Streets in Montclair, N. J., by contractors and public utility corporations the Board of Commissioners recently voted to increase the deposit required for a permit to open a street from $10 to at least $50, and to require a written guarantee that the street will be properly relaid. Contractors are also required to give bond. An effort is being made to have all water, sewer and gas connections made before the pavement is put down.

MEETINGS

Calendar of Coming Meetings

Nov. 26-27.—Alabama Good Roads Association.—Annual convention, Hillman Hotel, Birmingham, Ala. Secretary, J. A. Rountree, Birmingham, Ala.

Dec. 4-6.—American Association of State Highway Officials.—Annual meeting, Hotel Jefferson, Richmond, Va. Acting Secretary, H. M. Berry, Chapel Hill, N. C.

Jan. 12, 1918.—Northwestern Society of Highway Engineers.—Annual meeting, Benson Hotel, Portland, Ore. Secretary, C. G. Reiter, Hillsboro, Ore.

Jan. 15-17, 1918.—Virginia Good Roads Association.—Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

Feb. 7-9, 1918.—American Concrete Institute.—Annual convention. La Salle Hotel, Chicago, Ill. Secretary H. D. Hynds, 244 Madison avenue, New York, N. Y.

Feb. 8-9, 1918.—American Concrete Pipe Association.—Annual convention. Sherman Hotel, Chicago, Ill. Secretary, J. H. Libberton, 208 S. La Salle St., Chicago, Ill.

American Association of State Highway Officials

Military roads, the effects of the war upon the work of road builders, and federal aid are to occupy much of the attention of state highway officials at the annual meeting of their organization which will be held at the Hotel Jefferson, Richmond, Va., Dec. 4 to 6, inclusive.

The program for the first day of the convention, Tuesday, Dec. 4, provides for forenoon and afternoon sessions and a theater party in the evening. At the forenoon session, President G. P. Coleman, State Highway Commissioner of Virginia, will deliver the presidential address and the topic, "Present Conditions Affecting Road Construction, and Measures Taken to Meet Them," will be discussed. Among those scheduled to take part are W. D. Uhler, Chief Engineer of the Pennsylvania State Highway Department, S. E. Bradt, Superintendent of Highways of Illinois, and W. S. Keller, State Highway Engineer of Alabama.

The afternoon session will be taken up by discussions of set topics, a general discussion and the appointment of committees. The topic, "Car Shortage, Present Conditions and the Remedy," will be presented by Chas. M. Upham, Chief Engineer of the Delaware State Highway Department, and discussed by F. F. Rogers, State Highway Commissioner of Michigan, and Clinton Cowen, State Highway Commissioner of Ohio. Wm. D. Sohier, Chairman of the Massachusetts Highway Commission, will open the discussion on "Military Roads, Why and Where," and will be followed by Wm. F. Cocke, State Road Commissioner of Florida, Geo. A. Duren, State Highway Engineer of Texas, and Rodman Wiley, Commissioner of Public Roads of Kentucky.

The topic for the morning session on Wednesday is "One Year's Experience with the Federal Aid Road Law." The principal speaker will be Logan Waller Page, Director of the Office of Public Roads and Rural Engineering, U. S. Department of Agriculture. According to the program, the Office of Public Roads has arranged to send a representative or representatives who will discuss briefly the requirements of federal aid work, under a variety of heads.

At the afternoon session on Wednesday the discussion of the morning topic will be continued and T. H. MacDonald, Chief Engineer of the Iowa State Highway Commission, will lead the discussion of the question, "Should an Effort be Made to Amend the Federal Aid Road Law? If So, in What Respects?" The discussion will be continued by H. G. Shirley, Chief Engineer of the Maryland State Roads Commission, C. M. Babcock, Commissioner of Highways of Minnesota, W. S. Fallis, State Highway Engineer of North Carolina, and T. J. Ehrhart, State Highway Commissioner of Colorado.

Wednesday evening will be devoted to the annual dinner of the association at the Hotel Jefferson.

The sessions on Thursday will be devoted to the consideration of maintenance. Four topics are scheduled for the forenoon session. These topics, with the names of those scheduled to lead the discussions, are as follows: "Recent Developments in the Design and Construction of Road Surfaces," H. Eltinge Breed, First Deputy Commissioner, New York State Commission of Highways; "Another Year's Experience in Maintaining a State System of Macadam Roads," H. G. Shirley, Chief Engineer, Maryland State Roads Commission; "The Maintenance of Brick and Cement Concrete Roads," F. F. Rogers, State Highway Commissioner of Michigan; "The Maintenance of Gravel Roads," Paul D. Sargent, Chief Engineer of the Maine State Highway Commission.

The topics for the afternoon session are: "Maintenance of Earth Roads," John H. Mullen, Deputy Commissioner of Highways of Minnesota, and "The Maintenance of Steel Bridges, Paints," W. S. Gearhart, State Highway Engineer of Kansas.

At this session there will also be taken up the reports of officers and committees, the election of officers for the coming year, and other business.

National Paving Brick Manufacturers Association

The combined action of business associations in the United States to bring about the revocation of the Government's priority order No. 2 which prohibits the use of open top cars for the transportation of road building materials was advocated at the conference of the National Paving Brick Manufacturers Association at Cleveland, O., on Monday and Tuesday of this week.

In support of the proposed construction of a national system of improved highways connecting the larger cities, the inability of the railroads to cope with the present demands of transportation was cited as evidence of the need for highways capable of sustaining heavy motor truck traffic.

Charles A. Otis, President of the Cleveland Chamber of Commerce, in his address of welcome to the visitors, spoke of certain problems involved in securing highway improvement. F. H. Caley, Secretary of the Cleveland Automobile Club, emphasized the necessity for cooperative effort to secure the improvement of connected highways systems. He said, "We must get down to business and build roads that will help this nation with the war."

What is being done in the way of road work in France to facilitate highway traffic was told by John A. Penton, the publisher of the "Iron Trade Review."

Tuesday's session included the report of Secretary Will P. Blair, and the election of officers.

President C. C. Blair was reelected, as was Secretary Blair. J. L. Murphy, of Columbus, O., was chosen vice president in place of J. W. Robb, of Clinton, Ind., who declined reelection. C. C. Barr, of Streator, Ill., was reelected treasurer. H. H. Macdonald, for several years assistant secretary, resigned to take up other work.

PUBLICATIONS

"THE EFFECTS OF EXPOSURE ON SOME FLUID BITUMENS," By Charles S. Reeve, Chemist, and Richard G. Lewis, Assistant Chemist, Office of Public Roads and Rural Engineering, U. S. Department of Agriculture. Reprinted from the "Journal of Industrial and Engineering Chemistry," Vol. 9, No. 8, August, 1917. Paper, 6x9 in., 11 pp. and covers; illustrated.

This publication discusses the effects of exposure on various bitumens and explains the methods used in determining them. The analyses of these products, changes in materials on exposure, changes on 163° C. volatilization, and selected data for comparison of results are given in tabular form.

"INFLUENCE OF GRADING ON THE VALUE OF FINE AGGREGATE USED IN PORTLAND CEMENT CONCRETE ROAD CONSTRUCTION," By F. H. Jackson, Jr., Assistant Testing Engineer, Office of Public Roads and Rural Engineering, U. S. Department of Agriculture. Reprinted from the "Journal of Agricultural Research," Vol. X, No. 5. Published by authority of the Secretary of Agriculture, with the cooperation of the Association of American Agricultural Colleges and Experiment Stations. Paper, 7 x 10¼ in., 12 pp. and covers; illustrated.

The matter treated in this reprint covers experimental work on the effects of grading the fine aggregate on the strength of concrete mixtures used in road construction. Tables showing the mechanical analysis of the sand and the proportion of artificially graded sands used are included. The results of the hardness, toughness, tension, and compression tests are shown by diagrams and discussed in the text.

WAYNE COUNTY, MICH., BOARD OF COUNTY ROAD COMMISSIONERS.—Eleventh annual report to the Board of Supervisors of Wayne County, from Oct. 1, 1916, to Sept. 30, 1917. Paper 6x9 in., 80 pp. and covers; illustrated, inset map.

This report is intended to show the amount spent on highway and bridge improvement in Wayne County, Michigan, and how and where it was expended, during the period covered, and the progress made in the development of a modern system of highways, bridges and culverts, including their maintenance, with recommendations for future operations. Among the subjects treated separately are, the county park system, the erection of sign boards, bridges and culverts, the Covert Act, township roads, and road maintenance. The report also contains chapters entitled "How Wayne County Builds Roads" and "Important Changes and Additions to the Highway Laws of Michigan," and specifications for concrete roads and pavements. The text is accompanied by a large number of half-tone illustrations and an inset road map of the county, printed in three colors

"TOUGHNESS OF BITUMINOUS AGGREGATES," by Charles S. Reeve, Chemist, and Richard G. Lewis, Assistant Chemist, Office of Public Roads and Rural Engineering, U. S. Department of Agriculture. Reprinted from the "Journal of Agricultural Research," Vol. X, No. 7, and published by authority of the Secretary of Agriculture, with the cooperation of the Association of American Agricultural Colleges and Experiment Stations. Paper, 7x10¼ in., 16 pp. and covers; illustrated.

A large portion of the contents of this volume consists of ten tables in which the following data are presented: I, Physical tests of rock used in preliminary toughness work; II, Analysis of water-gas tar; III, Analysis of petroleum and asphalt products; IV, Toughness tests on bituminous-aggregate cylinders; V, Physical tests of rocks used in second series of toughness tests; VI, Effect on toughness of variation of rational proportion of bitumen and sand; VII, Percentage of weight of bitumens used in mixtures on basis of rational proportion of 88 parts of mineral aggregate to 12 parts of bitumen; VIII, Toughness tests on bituminous aggregate cylinders (second series); IX, Petrographic analyses of crystalline rocks used in toughness cylinders (second series); X, Grading of aggregate from cylinders after compression with percentage of voids in compressed cylinders. The illustrations show the various aggregates used.

"EXPERIMENTAL ROADS IN THE VICINITY OF WASHINGTON, D. C"—U. S. Department of Agrictulture Circular No. 77, issued Oct. 15, 1917. Prepared by B. A. Anderton, Assistant Chemist, and J. T. Pauls, Junior Highway Engineer, Office of Public Roads and Rural Engineering, U. S. Department of Agrictulture. Paper, 6x9 in,, 8 pp.

Contained in this circular are data covering the sequence of sections, methods of construction and maintenance, and up-to-date cost records relating to the experimental roads which have been constructed in and near Washington, D. C., during the past six years by the Department of Agriculture. The greater portion of the contents is shown in tabular form. The experimental highways are as follows: At Chevy Chase, Montgomery County, Md., bituminous macadam and surface treatment, and bituminous concrete, cement concrete, oil-cement concrete, bituminous surface treatments on concrete and vitrified brick; Bradley Lane, Montgomery County, Md., bituminous macadam; Rockville Pike, Montgomery County, Md., tars and oils—surface treatment on water bound macadam; Falls Road, Montgomery County, Md., bituminous surface treatments on water bound macadam; Washington, D. C., surface treatments on water bound macadam, and bituminous concrete on a 6-in. foundation of 1:3:7 cement concrete; Mount Vernon Ave. Road, Alexandria County, Va., bituminous macadam, bituminous concrete, bituminous gravel concrete; Russell Road, Alexandria County, Va., bituminous macadam and bituminous gravel; Alexandria-Gum Spring Road, Fairfax County, Va., bituminous gravel concrete and soil-asphalt surface on an old gravel road; Mount Vernon Road, Fairfax County, Va., bituminous surface treatment on a new gravel road.

PERSONAL NOTES

George E. Martin, Professor of Highway Engineering at Purdue University, has joined the U. S. Engineer Corps.

J. H. Hallett, formerly Chief Clerk of the Engineering Department of Jacksonville, Fla., has been made Assistant City Engineer.

Allen T. Russell, former County Surveyor of Du Page County, Illinois, and later City Engineer of Wheaton, Ill., has been elected City Surveyor of Baltimore, Md.

Lieut. K. F. Keeping, who was on leave of absence from his office as City Engineer of Niagara Falls, Ont., Can., was killed on Oct. 28 while in action, according to report.

J. S. Sourwine, County Engineer of San Bernardino County, California, has been ordered to Fort Leavenworth, having been made a captain in the Engineer Officers' Reserve Corps.

C. F. Heintze, Assistant Engineer of the Sacramento County (California) Highway Commission, resigned recently and is now first lieutenant in the Engineers' Training Camp, Vancouver, Wash.

J. P. Kemmerer, Deputy County Surveyor, has been appointed Acting County Surveyor of San Bernardino County, California, during the absence of James S. Sourwine, who has been called to military service.

M. Hannah, former County Engineer of Lamar County, and more recently Assistant County Engineer of McLennan County, Texas, has been appointed County Engineer to succeed R. J. Windrow who resigned to become State Water Engineer.

EQUIPMENT — TRADE — MATERIALS

Removing Asphalt Pavement With Hammer Drills

The use of hammer drills for making openings in an asphalt pavement on a concrete foundation is shown in the accompanying illustrations. The work shown was done on Market St., San Francisco, Cal., by the Pacific Gas & Electric Co., which often has occasion to open the street for access to its underground pipes and wires.

DRIVING LAGGING WITH BC-19 SULLIVAN HAMMER DRILL

The equipment employed by the company consists of a portable, electrically driven air compressor, hose, and drills fitted with cutting tools of various types.

In blocking out the work a trench is cut around the section to be removed, using a chisel-shaped tool with a cutting edge about 3 in. long. The other end of the tool fits into a class BC-19, air jet sinker pattern, Sullivan hammer drill. When very hard concrete foundation is encountered a class DP-33, rotator pattern, drill is used with a regular ⅞-in. steel. In such cases holes are drilled at an angle of about 45 degrees and wedges are driven in. Ordinarily, however, after an opening has been made the concrete can be removed by gads and a BC-19 tool. Most of the gads used in this way are attached to the tool by a chain. This is fastened at one end to a clamp around the drill and at the other to the gad, which is drilled near the shank. One of these in use is shown in one of the accompanying illustrations.

CUTTING ASPHALT PAVEMENT WITH SULLIVAN HAMMER DRILL—SAN FRANCISCO, CAL.

When it is necessary to put in lagging, it is driven by one of the BC-19 tools. This use is shown in the smaller illustration.

The drills used are made by the Sullivan Machinery Co. of Chicago, Ill.

Notes

The Jordan & Steele Mfg. Co., maker of the "Michigan Jr." gravel screener and loader, has moved from Hastings, Mich., to Charlotte, Mich. The company has erected a new factory at the latter city and has greatly increased its facilities for the manufacture of the screener and loader used by road builders.

The Universal Portland Cement Company of Chicago, Ill., is sending out to its employees a circular letter, signed by President B. F. Affleck, urging economy during the war. The letter especially emphasizes the desirability of conserving food. It also urges the purchase of Liberty Bonds, and points out that they should be paid for out of current savings instead of savings in banks.

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Reynolds County, Missouri, passed a $100,000 road bond issue at an election held on Nov. 3 by a vote of 6 to 1. Every precinct in the county voted for the issue.

Trading Old Road Machinery for New is recommended by the Missouri State Highway Department, which says that old graders that have been "junked" ought to be sold or traded for equipment that can be used, and that in many counties there is enough discarded road machinery to pay for a number of good tools. The department also points out that grading machinery should be taken to a blacksmith shop to be put in good repair for spring work.

The Jackson Highway, Which Extends from Nashville, Tenn., to New Orleans, La., will be opened to the public in about one year if construction work on the route is not hindered by delayed shipments of material. All the counties traversed by the highway are doing whatever is necessary as rapidly as possible to complete the road. Many portions of the route provide delightful drives, among the most interesting stretches being between Biloxi and Pass Christian, Miss., and about 50 mi. of road between New Orleans and the Mississippi-Louisiana line.

A Trip over the Washington-Atlanta Section of the Bankhead Highway was recently made by Senator John H. Bankhead, of Alabama, Chairman of the Senate Committee on Post Offices and Post Roads; T. S. Plowman, President of the Bankhead Highway Association; H. M. Rowe, President of the American Automobile Association, and J. A. Rountree, Secretary of the Bankhead Highway Association. The trip was made in a car driven by Mr. Rowe, and addresses were made at numerous towns en route. Senator Bankhead, who is 75 years old, made more than a hundred speeches.

GOOD ROADS

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WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

Old Series, Vol. LII.
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NEW YORK, DECEMBER 1, 1917

Number 22

Washout on a New England Country Road

Good drainage has been urged time and again as one of the first essentials of a good road. That it is as necessary for the prevention of damage from unusual causes as it is for keeping roads in good shape under ordinary conditions is shown very clearly by the accompanying illustrations.

The road is a country highway in the southern part of New Hampshire. The washout occurred during one of a number of hard thunder storms that swept over that section last August and did much damage to the roads. Some of the highways were impassable for several days.

According to information furnished by a correspondent, this washout was caused by "a low-hanging rain cloud sweeping across a lake and striking a high hill. The cloud apparently struck a long line of poplar trees on the crest of the hill and beside the road, and burst. The water ran off down the road on both sides of the hill, but the greater volume went over the road shown in the photographs."

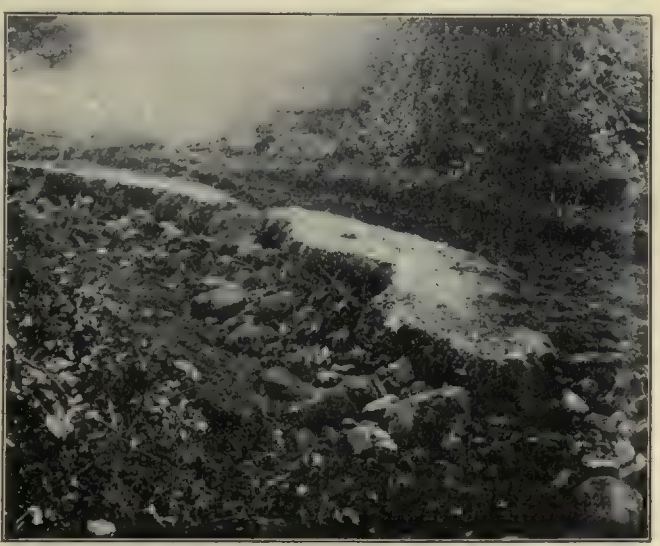


Figure 1.

Fig. 1 shows a curve about half way down the hill where the condition of the roadbed is typical of that on the rest of the road. On each side of the center the roadbed was cut down from 1 ft. to 4 ft. over a strip in some places 4 ft. wide. The large stones visible in the foreground were put in by a road gang that had started repair work. The original fill, it is reported, "was made with large rocks mixed with small for a foundation, and tree roots, sand, and dirt for the surface."

Fig. 2 shows the road at the foot of the hill. Here the surfacing was washed away in the center of the road, leaving the foundation stones exposed, and the sides were washed as on the remainder of the road.

Fig. 3 is a view looking up the hill from the bottom.

Practically all of the surfacing was washed down the hill and into a pasture, about half an acre of which was covered with sand, earth and stones.

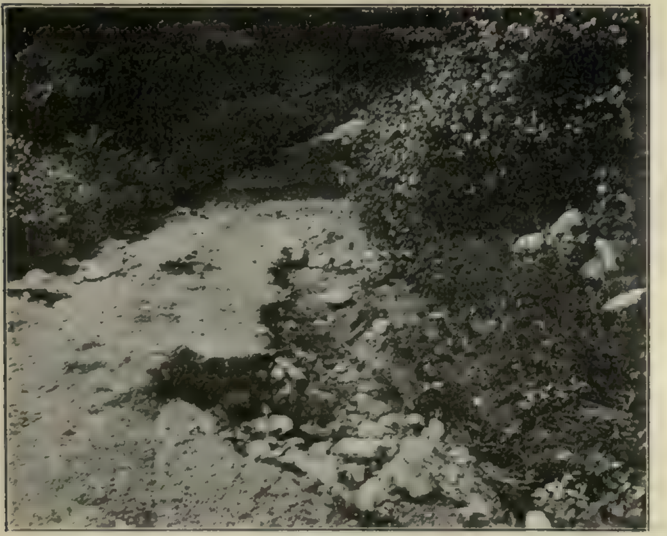


Figure 2.

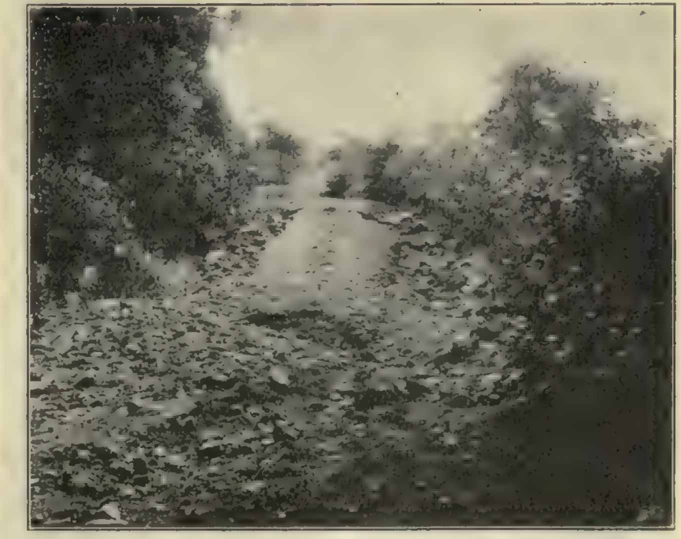


Figure 3.

EFFECTS OF SEVERE STORM ON A TYPICAL IMPROPERLY DRAINED ROAD.

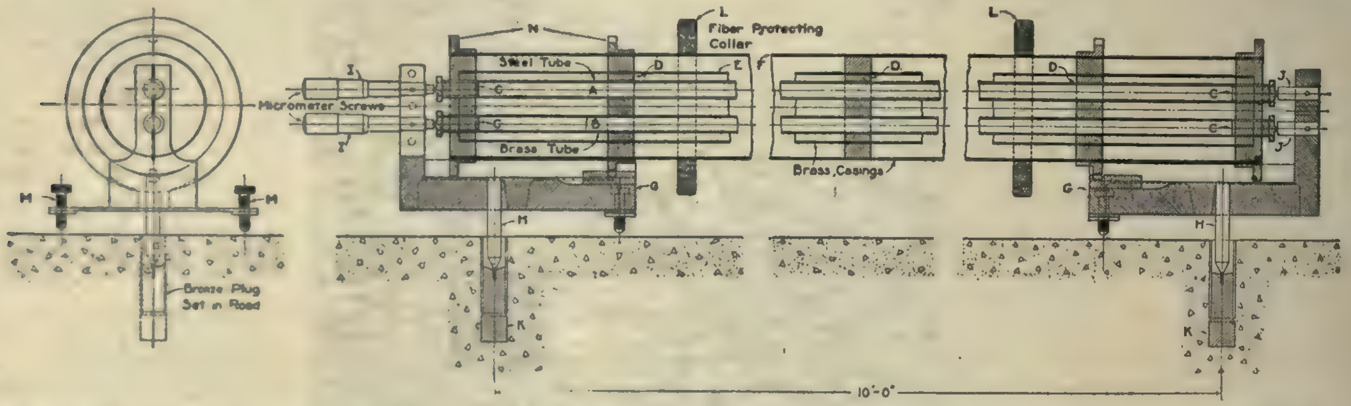
Experiments on the Contraction and Expansion of Concrete and Concrete Pavements

A series of experiments on the expansion and contraction of concrete and concrete pavements has been made by the Office of Public Roads and Rural Engineering of the U. S. Department of Agriculture. The work was started in 1910 and has been described in detail in Bulletin 532 of the department, prepared by A. T. Goldbeck and F. H. Jackson, Engineer of Tests and Assistant Testing Engineer, respectively, under whose direction the experiments were made. Brief mention of the bulletin was made in "Good Roads" for Nov. 10. The data which follow are from the bulletin.

The work was divided into two parts, the first comprising extended laboratory tests and the second a series of observations on concrete pavements in different places.

In the laboratory tests the specimens used were concrete columns 8 in. square and 5 ft. high. These were made of various mixtures and were tested under varying conditions and at ages ranging from a few days to over two years.

All mixtures were proportioned by weight. They were made of a standard brand of Portland cement that passed the specifications of the American Society for Testing Materials, Potomac River sand, and crushed gneiss or gravel. All concrete was mixed by hand. Various consistencies were used, ranging from a very dry mixture containing about 8.5%, by weight, of water, to a wet mixture containing from 10 to 12% of water. The very dry mixtures were tamped into the molds, while the very wet ones were merely puddled.



APPARATUS USED FOR MEASURING THE EXPANSION AND CONTRACTION OF CONCRETE PAVEMENTS ON SECTIONS OF EXPERIMENTAL ROAD.

The expansion or contraction of the specimens was measured by the change in distance between two steel bars embedded in each concrete column, 50 in. apart, center to center. These bars were ½ in. square and projected from each side of the column. The ends were fitted with steel plugs having rounded conical points. Readings were taken on both sides of the specimens and averaged to equalize unequal expansion.

The instrument used for measuring consisted of two 5/16-in. steel rods connected at the ends by cross pieces, one of which carried a flat ended steel pin and the other a micrometer head reading to 0.0001 in. The flat ended pin was held against the lower conical point on the bar embedded in the specimen and the micrometer was screwed down until it came in contact with the conical point on the upper bar. The necessary precautions for constant temperature were carefully observed, and all readings were corrected to eliminate difference of temperature. The measuring instrument was also frequently tested on a steel gauge bar to prevent errors due to wear or accident.

Various curves showing the relation between the age in days and the change in length of the specimens are reproduced in the bulletin. They show results on neat cement; mortars and concretes of various mixtures and consistencies; specimens stored in air and in water, and alternately wet and dry; plain and reinforced concrete; concrete containing hydrated lime; tar coated concrete; and columns reinforced on only one side.

The observations on concrete pavements were made with the specially designed instrument shown in the accompanying illustration. As it was known that the movement in the concrete would be small, it was necessary to have a measuring apparatus of great accuracy. As it was also known that that instrument would be subjected to a great range of temperature during different parts of the day and at different seasons of the year it was necessary to have some means of correction for these changes. In addition, it was considered advisable to make the measurements over a considerable gauge length because of the extremely small changes in length expected in the concrete. The instrument devised had a gauge length of 10 ft. and was used to measure the distance between plugs set in the concrete road selected for tests.

The description of the machine as printed in the bulletin follows:

> The tubes A and B are the gauge tubes, and they are supported at frequent intervals by brass disks, D, fastened within a brass casing, E, 2 in. in diameter. This casing extends the full length of the instrument and is surrounded and supported at intervals by another casing, F, 3 in. in diameter. At the ends of this outer casing are two collars, N, which rest in the supporting blocks, G. These blocks are provided with pins, H, whose conical ends fit into holes drilled in bronze plugs set in the road during its construction. One end supporting block, G, is provided with flat-ended contact pins, J, and the block at the other end of the instrument carries micrometer screws, I. Adjusting screws, M, shown in the end view are provided merely to support the instrument on the road, when not in use. The fiber collars, L, likewise are provided merely for protection when the tube is detached from the end supporting block.
>
> The great length of the instrument with the consequent attendant probability of the temperature at the two ends being different, due to one end being in the shade and the other in direct sunlight, led to the use of two gauge tubes of different materials from which to take measurements. Knowing the coefficients of expansion of these tubes, obtained by proper calibration, the difference in the micrometer readings furnished a means of obtaining the temperature of the bars. This temperature then could be used in correcting the micrometer measurements to a standard temperature. Thermometers were inserted in the 2-in. casing at the ends of the instrument. The mean

of these end temperature readings, as a rule, approached within 1° C. of the temperature obtained from the micrometer readings.

Before using this instrument on the road it was calibrated in order to obtain the coefficients of expansion of the steel and brass tubes. In doing this a 10-ft. steel gauge bar was mounted in a tank of water and immersed about 1 in. below its surface. Thermometers were laid in the water on top of the gauge bar and read from time to time to insure that the temperature was not changing. The instrument then was mounted on the gauge bar, and a jet of steam was passed through the inner casing surrounding the steel and brass tubes. When the temperature of this inner casing had become constant, micrometer readings were taken. A stream of cold air then was run through, and again temperature readings were taken at each end of the instrument, until it was determined that the inside temperature had become constant. Micrometer readings were taken again. Several sets of readings made in this way gave values for the coefficient of expansion of the steel tube averaging 0.0000110 per degree centigrade, and for the brass tube 0.0000179. Knowing the difference in readings in the steel and brass tubes at the two measured temperatures, and having determined the coefficients of expansion of the metals, a curve giving the difference in length of the bars at various temperatures was plotted readily. When readings were made out on the road the temperature of the bars of the instrument was obtainable easily by means of the difference in their measured length.

Measurements were made on an experimental road at Chevy Chase, Md., and on the Ohio Post Road in Muskingum and Licking Counties.

The road at Chevy Chase is on Connecticut Ave. and was built in 1912 and 1913. It is composed of six different sections, three of which are of cement concrete. One of these sections was surface treated with bituminous material and one was built of oil cement concrete. The first set of measurements was taken as soon as practicable after the concrete had hardened. In the spring, summer and fall of 1913, other readings were taken and were followed by an incomplete set of measurements in April, 1914, and complete sets later.

The observations on the Ohio Post Road were taken on three 300-ft. experimental sections of concrete road built in 1914 by the Office of Public Roads and Rural Engineering. Measurements on Section 1 were taken in July, 1914, in October, 1914, in March, 1915, in June, 1915, and in February, 1916. Measurements on Section 2 were made in August, 1914, November, 1914, March, 1915, June, 1915, and February, 1916. Measurements on Section 3 were made in November, 1914, March, 1915, June, 1915, and February, 1916.

The results of the measurements and observations on these two roads are summed up in the bulletin as follows:

General Discussion of the Expansion and Contraction of Concrete Pavements

The preceding laboratory and field measurements show that concrete changes in length owing to at least two separate agencies: (1) Change in moisture content and (2) change in temperature.

(1) Change in Moisture Content.—By laboratory measurements made on large specimens it has been demonstrated that concrete changes in length from its wet condition just after setting to an extremely dry condition at six months or one year later by an amount equal to 0.0005 to 0.0006 in. per in. of length. A change of 0.0006 in. is as much as would be caused by a change in temperature of 0.06 ÷ 0.0000055 = 109° F. and would produce considerable stress under favorable conditions. This change, however, is a very slow one. It occurs most rapidly during the first few weeks of drying out and becomes very slow at the end of three months. At one year the change due to drying will have become constant in amount. It has also been seen that when concrete is kept wet it does not contract, but it expands and maintains a constant expansion of about 0.0001 in. per in. of length. Furthermore, it has been demonstrated that by subjecting hardened concrete to alternate wetting and drying, its length may be changed irrespective of temperature changes. Such moisture changes, however, are rather slow in their action and a prolonged period of wet conditions or a prolonged period of dryness is necessary to effect a large change in the length of the concrete such as might be obtained in a very short time by the influence of temperature. When specimens are stored in the weather and subjected to rain and sunshine, they change very little in length because of moisture changes, unlike specimens that are stored under prolonged conditions of extreme wetness or dryness.

In the field measurements on the Chevy Chase and Ohio Post roads, except that at Mount Sterling, Section III, it is difficult to distinguish the effects of moisture, since apparently they are overshadowed so greatly by the temperature expansion and contraction. It seems that the concrete in the road, when subjected to actual weather conditions, does not suffer the prolonged extreme ranges of moisture content suffered by the laboratory concrete specimens kept indoors in the dry air of the laboratory and therefore does not expand or contract because of moisture changes to the extent that the laboratory specimens change. Undoubtedly in warm, dry weather there will be some slight contraction just after the moisture is allowed to dry out from the concrete, particularly in a well drained sub-base. It seems that enough of the water absorbed by the concrete, due to rains or to capillarity, remains in the concrete during the dry weather to prevent much change in length. There may be conditions of prolonged extremes of wetness and dryness in the road which will affect the expansion and contraction to an appreciable extent. Thus in the spring of the year the prolonged moisture of the previous winter might so aid the expansion occurring during the first day of high temperature that the road will heave where proper allowance has not been made for this expansion. There are also conditions of poor drainage in the sub-base, particularly in a low section in the road, where the concrete will be practically constantly saturated, in which case the expanding effect of the moisture will be in evidence.

(2) Effect of Variation in Temperature-Field Measurements.—It has been pointed out that, as a rule, the concrete in a road expands and contracts as the temperature rises and falls. It will be interesting to compare the actual measurements of the expansion and contraction of the concrete in the road with the calculated change, assuming no friction at the base and assuming a coefficient of expansion of 0.0000055 per degree F. Table I shows a comparison of the actual with the theoretical unit changes in the concrete of the Ohio Post Road.

TABLE I.—CHANGE IN LENGTH OF CONCRETE IN OHIO POST ROAD.

	Section I.			
	Oct. 31	Mar. 4	June 19	Feb. 25
Change in temperature	—32	—52	—14	—48
Actual unit change	—0.00017	—0.00031	—0.000064	—0.00023
Calculated temperature change	—0.000176	—0.00029	—0.000077	—0.00026
	Section II.			
	Nov. 2	Mar. 3	June 17	Feb. 25
Change in temperature	—22	—45	+3	—38
Actual unit change	—0.000076	—0.000227	+0.000024	—0.000168
Calculated temperature change	—0.000121	—0.000248	+0.000017	—0.00021
	Section III.			
	Nov. 7	Mar. 6	June 15	Feb. 22
Change in temperature	+3	—14	+24	—10
Actual unit change	+0.0000096	—0.000109	+0.000148	—0.000072
Calculated temperature change	+0.0000165	—0.000077	+0.000132	—0.000055

These comparisons of the actual change with the theoretical change, considering temperature alone to be the cause, are interesting. Observe that in Section I the agreement of the theoretical with the actual change in length is quite close, indicating that temperature was almost the sole cause of the change, and indicating, moreover, that the resisting effect of friction at the base must have been small. In Section II the agreement is not quite so close, and in Section III the agreement is poor. The actual unit change in many cases is in excess of the calculated temperature change, thus indicating that moisture is causing some expansion and also that the restraining effect of friction in preventing expansion and contraction may be quite small.

The discrepancies between the measured changes and theoretical changes are very noticeable in Section III. It will be seen from the description of Section III that it lies at the bottom of two 6% grades and the conditions are very favorable for a wet sub-base. Moreover, this section of the road was covered continually with mud tracked in from adjacent roads, and this aided in preserving the road in a moist condition. The actual change in length on June 15 and Feb. 22 was greater than the calculated change; and these days were preceded by a considerable period of wet weather, as shown by the precipitation curve. These conditions were promotive of a wet subbase, and this probably accounts for the increase in expansion of the actual over the theoretical. On June 15 the actual expansion is 0.000148 minus 0.000132, or 0.000016. On Feb. 22 the excess unit expansion equals 0.000127 in. As shown by laboratory measurements, this is approximately the amount of expansion produced in concrete by continued moisture, and this measurement therefore tends to confirm the presumption that the moisture effect is causing the difference between the actual expansion and calculated temperature expansion. The apparently small effect of friction in preventing expansion is interesting and is not unreasonable when it is considered that the pavement is subjected to continued vibration which would tend to relieve temporarily any friction between a wet clay sub-base and the concrete. Moreover, the slow yielding of the sub-base as the concrete creeps helps to relieve the stresses of friction.

The foregoing expansion and contraction measurements are presented in the hope that they will be of assistance to the engineer having charge of concrete road construction. Much theory might be developed from these measurements, but this development, together with the practical application of the results, will be left for the present to the constructing engineer. Some broad conclusions may be stated as the result of the investigations described, combined with the investigation of others.

Conclusions, Based on Expansion and Contraction Measurements

1. Neat cement when allowed to dry, first contracts rapidly, then more slowly. The amount of contraction seems to vary with the cement, size of specimen, and condition of atmosphere in which drying takes place. The amount at 28 days is about 0.1% and at 6 months about 0.2%.

2. Mortar contracts on hardening in air and expands on hardening in water. The contraction in warm, dry air at 28 days is about 0.045% for 1:2 and 1:3 mortar and at 6 months is 0.078% for 1:3 mortar and 0.085% for 1:2 mortar. The expansion in water is 0.01% for 1:3 and 0.017% for 1:2 mortar at 28 days, and at 6 months 0.013% for 1:3 and 0.02% for 1:2 mortar.

3. Both 1:2:4 and 1:3:6 concrete contract on drying in warm, dry air from 0.02 to 0.04% at 28 days and from 0.04 to 0.07% at 6 months. When hardening in water an expansion of about 0.01% takes place at 28 days and 6 months in 1:2:4 and 1:3:6 concrete.

4. The richness of of the mix of concrete seems to exert a small influence on the contraction; the richer the mix the greater the change in length.

5. Concrete alternately wetted and dried may be made to expand and contract owing to these causes. The expansion due to wetting is more rapid than the contraction on drying. The thoroughly dried specimens of concrete do not recover their original wet length when immersed.

6. Concrete stored in the outer air and exposed to the weather does not contract to the same extent as the above described specimens except under very dry conditions.

7. A waterproof covering, such as coal tar, prevents the rapid change in moisture content and greatly retards the expansion and contraction.

8. Reinforcement decreases, but does not prevent, the shrinkage and expansion of concrete due to drying and has no effect on temperature changes. Reinforcement can not, therefore, entirely prevent cracks, but seems to distribute them and keep them small.

9. Concrete roads are affected by both temperature and moisture. When the drainage is good and the sub-base not wet, the temperature effects seem to be most important. A wet subbase may add to the temperature expansion by about 0.01 to 0.02%. The restraining effect of friction at the base seems to be almost negligible when figuring temperature and moisture expansion and contraction. In very dry climates shrinkage due to drying must be added to contraction due to fall in temperature. A shrinkage of 0.04% (¼ in. in 50 ft.) is a safe allowance due to drying.

10. Temperature at time of construction of road should be considered in designing joints. Cold weather construction requires a full allowance for temperature expansion and, on wet sub-bases, for moisture expansion also. Hot weather construction theoretically requires no joints at all, even in wet sub-bases, as the temperature contraction exceeds the moisture expansion. However, the difficulty of keeping the cracks clear probably renders joints imperative.

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State Trunk Line Roads to Be Constructed by the Nevada Department of Highways

The work of constructing a system of state highways in Nevada is one which, from the standpoint of climate and topography, presents a number of difficult as well as interesting features. In the development of a cross-state route, for example, a variety of conditions, resulting from the existence of extensive areas of desert lands and of mountains, valleys and streams, must be met.

The new Department of Highways, created in March of the present year, was organized last summer, and its activities, according to R. K. West, State Highway Engineer, so far have consisted of surveys and other work preliminary to construction, which it is hoped may be begun during the coming season.

As Nevada is one of the larger states and communication by road is not without some difficulty the initial study of the proposed plan of improvement is in itself an important work. The act creating the Department of Highways also designated the roads to be constructed by it. The approximate locations of these highways are shown in the accompanying map, prepared by the department.

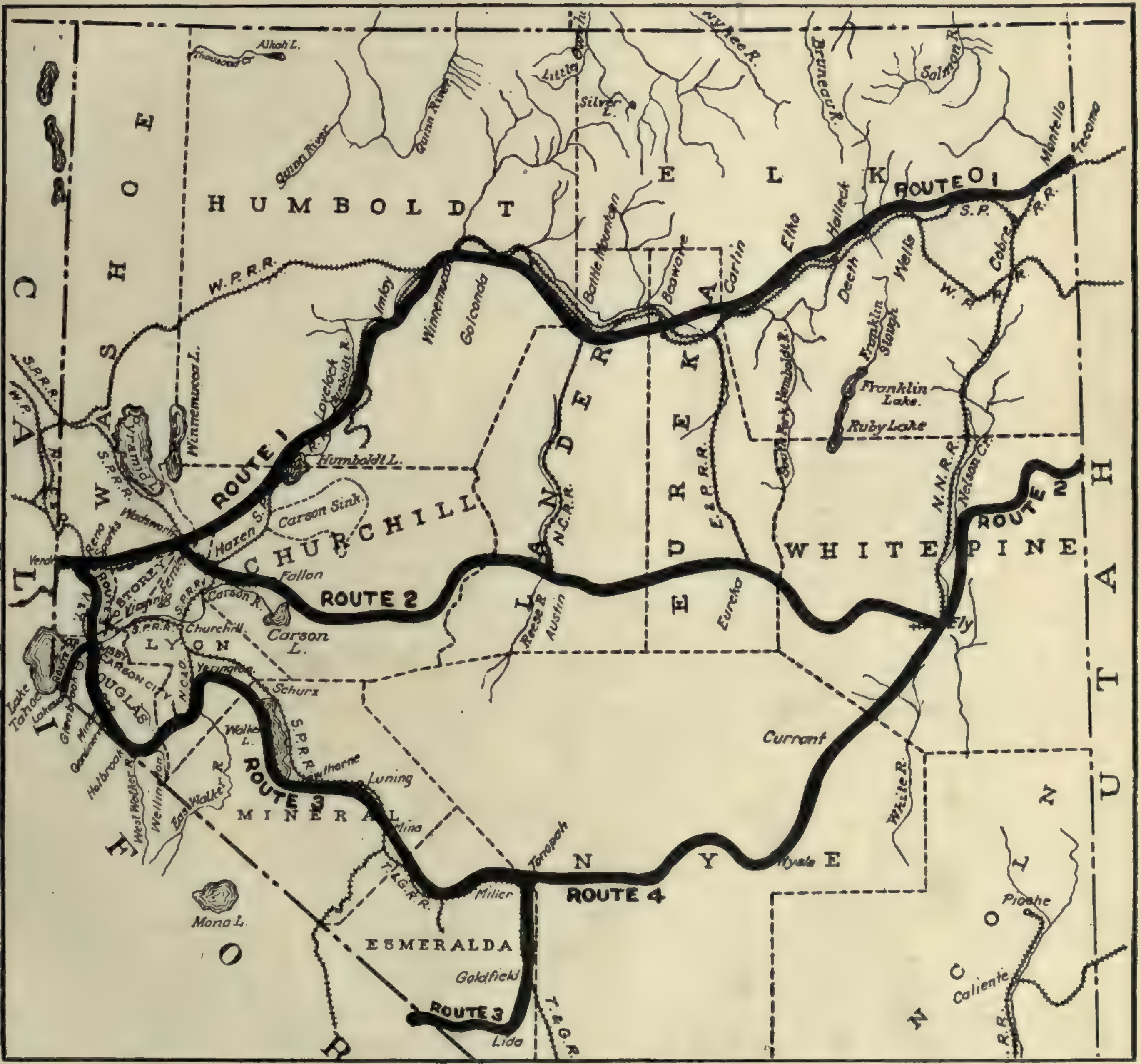
The system of state highways in Nevada provides four trunk routes. Route 1 starts at the Utah state line, just east of Tecoma, where it takes a westerly course through the towns of Montello, Cobre, Wells, Deeth, Halleck, Elko, Carlin, Beowawe, Battle Mountain, Golconda, Winnemucca, Imlay, Lovelocks, Fernley and Wadsworth to the city of Reno. From Reno it runs west through the town of Verdi to the California state line.

Route 2 begins at a point in White Pine County, also at the Utah state line, but at a considerable distance south of the beginning of Route 1. Traversing White Pine County the road runs first in a southwesterly direction to Ely, and from there westerly through the towns of Eureka, Austin, Fallon and Hazen, joining Route 1 between Hazen and Fernley. Reference to the map will show that the construction of these two roads over the most practical and available routes will provide highway communication between the more thickly inhabited sections in cross-state travel.

The other two main routes have a general north to south trend. Route 3 commences at Reno and serves the more important sections of western Nevada. From Reno it runs through the capital, Carson City, thence westerly to Glenbrook, on Lake Tahoe, a pleasure resort of great scenic beauty, whence it follows a southerly direction to the Nevada-California line at or near Lakeside. Beginning again at Carson City this road extends to Yerington, thence to the northerly end of Walker Lake and along the west shore of the lake to the town of Hawthorne, thence to Tonopah by way of Luning, Mina and Millers, and from Tonopah to Goldfield, from which point it runs in a westerly direction to the California state line.

Route 4 starts at Ely, in White Pine County, which, as shown above, is on Route 2, and runs in a southwesterly direction to Tonopah, thus providing highway communication through a part of the state where present means of travel by road are meager, but an improvement of undoubted value to the state.

It is proposed to apply Nevada's portion of federal aid funds to the construction of the system designated, the allotments so far made amounting to $193,194. The sum of $40,000 was appropriated by the Nevada Legislature from the general funds of the state treasury for highway purposes this year. The revenue from automobile taxation during the year ending June 30, 1917, amounted to about $30,000. The permanent state highway fund for construction, equipment and maintenance of state roads is produced by the levy in 1917 of an ad valorem tax of 7 ct. on each $100 of taxable property in the state. In 1918 and annually thereafter a tax of 10 ct. on the $100 will be levied.



MAP SHOWING PROPOSED STATE HIGHWAY SYSTEM OF NEVADA.

The plan of cooperation between state and counties is set forth in the Nevada highway law, given with some detail in the issue of May 5, 1917. In addition to the funds derived from the above named sources, Nevada comes in for a share of federal aid on account of national forest roads, the apportionment for the fiscal year 1917 being $19,195, and for the fiscal year 1918, $19,296.

In 1916 there were 12,182 mi. of public rural roads in the state, about 2.6% of this mileage being surfaced, according to the statistics of the Office of Public Roads and Rural Engineering.

Numerical Designation of Highways in New Mexico

Numerical designations are used for highways in the State of New Mexico, the plan having been adopted partly to facilitate the accounting work of the State Highway Commission.

Each main road is given a number, as Road No. 1, Road No. 2, etc. The portion of a road in any county is called a division and is named for the county traversed. The division is further subdivided into sections, each section consisting of 10 mi. of road. For instance: "Road No. 2, Sandoval Division, Section 3," indicates the third 10-mi. portion of the Santa Fe-Roswell Road (Road No. 2) in Sandoval County.

Cost data are kept for each road, division and section.

Road Maintenance in Alabama*

It requires no effort to arouse the public to the importance of good roads and to secure appropriations for construction purposes. It is very interesting work to convert an old impassable trail into a well located, beautifully constructed highway, and the plaudits of the public are pleasing to the officials in charge. Maintenance of public roads, on the contrary, presents nothing to attract attention, is a monotonous every-day-in-the-year job, and too frequently is neglected. The average county commissioner is anxious to build one or more roads in his district, and until he succeeds is not willing to set aside a good sum of money annually for the maintenance of the roads constructed in the other districts. In other words, he plans for the construction of all roads before giving money, time and attention to maintenance. If a highway is well constructed and maintained there need never be any repair except after extraordinary floods, or bad weather. It should be borne in mind the difference between maintenance and repair. One definition of the word maintain is "to keep in any particular state." Repair means "to mend, add to, or make over."

To be good continuously, the highway must be kept in the state in which it is left after construction. No one can deny that it is cheaper to maintain a road than to make it over, or, in other words, repair it. The trouble generally is chargeable to the system, or rather lack of system.

Macadam Roads

Since the advent of automobiles, the water bound macadam road has proven the most difficult and expensive of the hard-surface roads to maintain. The traction effect of automobile wheels, combined with the suction of the rubber tires, rapidly removes the binder from the particles of stone. The weakest places in the surface give way first and holes rapidly develop at frequent intervals. The mere filling of such holes with broken stones will not satisfactorily repair the road, for the reason that before there is a union between the new and old stone, a good portion of stone is thrown out by rapidly moving vehicles.

As soon as a macadam road is completed, it must be made some one's duty to see that the slightest break in the surface has immediate attention to prevent disintegration of the surface and the development of a bad hole. In order that immediate attention can be given such places, it is necessary that stone varying in size from ½ in. to 1 in. be piled at convenient points along the road. A pile of repair stone every half-mile enables a man with a wheelbarrow to repair quickly any break in the surface.

To repair a break or hole in a macadam road, it is first important that any dust or mud that may have accumulated at the place be removed. After this has been done, the surface should be loosened with a pick and new stone placed and thoroughly tamped. Water should be used in making repairs if it is possible to get it. Care should be taken that a high place is not left where the hole was. Tamping the material thoroughly makes it unnecessary to leave the surface where the hole was higher than the general surface of the road.

If the road has become badly rutted, it will require the use of a scarifier and roller and the addition of much new material to make the surface smooth and even again. This work, of course, comes under the head of repair, rather than maintenance, but even with the best system of maintenance, there will come a time when the road is so badly worn, new material will have to be added. In order that a union may be had between the old and new stone, scarifying is absolutely necessary.

The shoulders and ditches must be kept clean and the culverts open. No obstruction should be permitted on any part of the right of way of the road.

Chert Roads

Chert roads are repaired almost identically as are macadam roads, so it is only necessary to call attention mainly to the different characteristics of chert and stone. Chert is a silica rock and as found in Alabama, is in a state of more or less decomposition. It binds much more rapidly than ordinary stone and, therefore, repairs can be more easily made with it.

As with macadam, holes should be thoroughly cleaned before filling with new chert. As a bond forms quickly between the old and new material, it is not necessary to scarify the surface of the patch. However, if the road has become badly rutted and pitted with holes, it is important that the entire surface be scarified before placing a new surfacing material on it. At every half-mile point, a pile of chert should be kept for maintenance work.

Gravel Roads

Of all water bound roads in Alabama, the gravel road has resisted the wear of modern vehicles much better than others, and especially is this true of sand-clay gravel roads. Sand gravel is devoid of binding material and such has to be added artificially to make a satisfactory surface. Naturally it is difficult to get the proper proportions of clay and sand, and roads so built are rarely as satisfactory as those surfaced with sand-clay gravel. Any water bound gravel road can be improved by frequent use of the drag during wet weather, and especially is this true of sand-gravel, or artificially mixed surface. There is a tendency for particles of gravel to work out onto the shoulders and the drag brings such material back and deposits it in the low places. Scarifying has to be resorted to when a thoroughly bonded road has become badly worn, and then a reasonable amount of new material should be added before the surface is reshaped. Like all other water bound roads, material for maintenance purposes should be kept at convenient intervals along the road.

Sand-Clay Roads

No cheap road can be maintained as easily and at as small an annual cost as a well constructed sand-clay road. It responds readily to a road machine and the surfacing material is usually very convenient. Like all others though, it is neglected until extensive and expensive repairs become necessary. If a sand-clay road which has been intelligently constructed is kept dragged at reasonably frequent intervals, say three times a month during December, January, February, March and April, and during rainy periods in the other months, it will give excellent service and serve all practical purposes. If too much sand is in the surfacing material, the road will tend to ravel or disintegrate and it becomes necessary to add a small amount of clay to the sandy section. A thorough harrowing should then be given the surface, after which the road should be thoroughly machined or dragged until the proper cross-section is obtained. Likewise, too much clay may develop in wet weather and the addition of sand becomes necessary. Sand can be incorporated in like manner as the clay. In very wet weather, traffic will incorporate the sand fairly well and it frequently becomes necessary to add sand to prevent slipping, when artificial mixing would be difficult.

Graded Earth Roads

There is more or less misunderstanding upon the part of county commissioners as to what is a graded road. A

(*Continued on page* 286)

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*From the 6th annual report of the State Highway Commission of Alabama for the period from April 1, 1916, to April 1, 1917.

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

December 1, 1917

PERSONNEL OF THE HIGHWAYS TRANSPORT COMMITTEE

The addition of a representative of the motor truck industry to the Highways Transport Committee has been suggested.

As noted in last week's issue, a resolution to that effect was passed at a recent meeting of the trustees of the Ohio Good Roads Federation and was brought to the attention of the Council of National Defence, the chairman of the Highways Transport Committee, and others in places of authority or influence. In addition, somewhat similar action was taken at the meeting of the National Paving Brick Manufacturers Association at Cleveland last week.

While the efficiency of a committee is apt to vary inversely as the number of members, it would seem that in this particular case the proposed addition of one member is advisable. It is evident that highway transportation is going to become of increasing importance as the war's demands upon the transportation facilities of the country grow greater and greater. Highway transportation, of course, means hauling by motor truck. And the development of such hauling on a large scale obviously calls for cooperation by the users of trucks, the builders of roads and the makers of trucks. Road builders and truck users are represented in the committee. Truck makers should be.

There are several men in the motor truck industry who have taken an intelligent and active interest in road affairs and it should be easy to find one among them who could devote the necessary amount of time and thought to the work of the committee. There are plenty whose patriotism would lead them to make any required sacrifice to serve.

QUARRYMEN WANTED IN THE ARMY

A special quarry regiment, consisting of six companies of 250 men each, has been authorized and is being raised by voluntary enlistment. The organization will be known as the 28th Engineers, National Army. Two companies have already been formed and are being trained at Camp Meade.

Detailed information about the regiment is given in the advertising pages of this issue, the space belonging to several of our leading advertisers having been contributed for that purpose.

The plan for recruiting the regiment contemplates the selection of men from the country's quarries. Its work will consist largely, it is stated, of preparing crushed stone for the road and railroad building incident to military operations on the Western Front. The regiment will be commanded by an engineer officer from the Regular Army and the other officers will be selected from the Engineer Officers' Reserve Corps, the men selected being those who have had experience in quarry work.

Service with this unit, like service with the 23rd Engineers, the "road building regiment," should attract those who wish to serve their country at the front but who also desire to serve in the capacity in which they can be most effective.

CONSTRUCTION AND MAINTENANCE

Most road builders take greater pride in building a road than they do in its upkeep.

In a brief reference to this characteristic in an extract from the current report of the Alabama State Highway Commission, printed elsewhere in this issue, one of the reasons suggested for it is the greater appreciation on the part of the public. While this doubtless partly explains the attitude taken by some road officials, the engineer's preference is probably more the result of temperament. The engineer is primarily a builder and very often his choice of a profession is an indication of his predilection for construction work. In other words, he doesn't like to build because he is an engineer but he is an engineer because he likes to build.

If this assumption is warranted by the facts, it naturally suggests that it is difficult to find an engineer with the necessary qualifications for maintenance work. And as a matter of fact, the number of engineers possessing the combination of required technique and temperamental qualities for doing maintenance work—aptitude for such work—is relatively small.

For this reason especial care should be exercised in the selection of men for maintenance departments, which, incidentally are often operated as separate divisions because of a realization of the average man's preference for building. And because it is not easy to secure efficient maintenance men, an able executive in this branch of work should be given ample pay and retained regardless of political or other extraneous influences.

LOCAL MATERIALS FOR ROAD MAINTENANCE

It is vitally necessary that road building be continued. It is equally—perhaps more—essential that the roads already built be maintained. This latter fact, though seemingly obvious, is often lost sight of in ordinary times. Under present conditions it must be kept in mind constantly.

Both the construction and the maintenance of roads are now carried on under great difficulties, difficulties that are fully appreciated by road builders and that need not be enumerated here. Because of them it is imperative that advantage be taken of every resource in the way of materials, equipment and labor.

So far as materials are involved the difficulties are chiefly in the way of transportation. The supply is unlimited and the problem of labor required for production or preparation can be at least partly solved by the employment of labor-saving machinery. In other words, the road builder must rely to a great extent upon the use of materials obtainable near the road. While existing restrictions upon shipping remain in force the importation of many of the common materials used in road work is out of the question.

A more general use of local materials has been urged in these columns many times. There are few localities where a careful survey of the country will not disclose stone, gravel, clay, or some material that can be utilized to keep the roads in good condition or, often, to actually improve them.

This has been recognized in Pennsylvania, where, according to a recent statement from the State Highway Department, Commissioner O'Neil is to take up the matter in a series of conferences with the county road authorities. The plan, as announced, contemplates the preparation of a program of work next year upon the roads considered of the greatest importance, local materials being used and the expense being met by the state and the counties.

Similar steps could well be taken elsewhere. Millions of dollars are invested in the improved roads of the country, and that investment can be safeguarded only by thorough and constant care of the roads.

Road Maintenance in Alabama

(*Continued from page* 284)

graded road is not a road that has simply been gone over with a road machine and rounded up in the center, but is a road that has been carefully located, and graded to such an extent that the hills have been cut and the gradients reduced and the bottoms so filled that water may not run over the road. Such a road necessarily must have adequate waterways.

The variation of soils makes the maintenance of graded roads quite difficult in some sections and easy in others. In the sticky red clay section of North Alabama and the black prairie sections of middle and west Alabama, the graded road must have a high crown. In other sections of the state, where the soil is of a sandy nature, a low crown is essential. Hard common sense must be the governing factor in determining the necessary crown a particular piece of road should have. Only a "blockhead" will give a road varying from sand to stiff clay the same crown from end to end, yet this has frequently been done. Frequent and intelligent use of the split log drag will keep any well graded and drained road in very fair condition, even in bad winter weather. Dragging a road once a month is just about as beneficial as dragging it once a year. It must be kept free from ruts and to do so, it should be dragged after each mud-making rain.

All Roads

All roads must drain well to be good. Ditches must be kept clean and parallel to the center line of the road. All waterways must be kept free from obstruction. Abutting property owners should not be permitted to convert the road to their selfish use by turning water from its natural course or dumping rubbish or other matter into the road. It is as much the duty of road officials to see that the road is not abused as it is to see that it is maintained. If a party willfully violates the road laws after being warned not to do so, he should be prosecuted. If the authorities are unwilling to enforce the laws, they should be repealed.

In concluding this article, which has been written especially for road commissioners, supervisors and overseers, we desire to appeal to all public-spirited men to give much thought and practical help to maintain the road which has been constructed. Don't urge your commissioners to build new roads if they are failing to maintain those that have already been constructed. Give them your support and encouragement in their efforts of maintenance and enforcement of the law. Don't throw cold water on honest efforts that may not be directed in the way that you think best. They will welcome friendly criticism.

Precautions Necessary for Concreting in Cold Weather

Favorable weather in the fall of the year offers a tempting opportunity to undertake concrete construction without taking adequate precautions against a sudden drop in temperature, according to an article by J. H. Ames, Bridge Engineer of the Iowa State Highway Commission, in a recent number of the "Service Bulletin," the official publication of the commission. The taking of such risks is justifiable only in extreme cases, according to Mr. Ames, and the continual recurrence of bridge failures caused by placing concrete in cold weather indicates that in the future the matter must be given more careful consideration.

It is a well established fact, according to Mr. Ames, that concrete deposited when the temperature is below 50° F. sets slowly and often has little strength for several months after being deposited. At the same time, it is possible to place concrete in cold weather without danger, this having been repeatedly demonstrated by the carrying on of concrete construction throughout the winter. There will be no loss in strength nor will serious defects ordinarily be noted if concrete is allowed to set during a period of from two to four days at a temperature well above freezing.

The precautions to be followed in laying concrete under severe weather conditions are given by Mr. Ames as follows:

"1. The concrete aggregate and water used should be heated so that the concrete shall have a temperature of not less than 70° F.

"2. Frozen lumps of sand or stone must not be used in the concrete. All frost should be removed from the concrete aggregate or cement before the mixing water is added.

"3. Protection to the new concrete should be adequate to prevent its temperature lowering until the concrete has set up. Preferably the concrete should be kept at a temperature that will insure rapid setting for a period of at least a week.

"4. The use of salt to raise the temperature of the mixing water should be discouraged except in cases where the surface of the concrete is not to be exposed to view. The white deposit which forms after the concrete is set is somewhat objectionable from an appearance standpoint. Salt in excess of 3%, by weight, of cement should not be used, as it is injurious to the steel and strength of the concrete.

"5. Forms should not be removed too soon after the concrete is poured, and in no case should traffic be turned on a concrete floor until the concrete has set up and in proper condition to take abrasive wear.

"6. Frozen concrete has the appearance of good concrete and is difficult to distinguish when in a frozen condition. Heat applied locally will soon thaw out a sufficient portion to enable an examination to be made.

"7. Use a cement that sets fairly rapidly and has a high strength at early ages. Some cements set very slowly when the temperature is below 50° F. Avoid such brands during cold weather if possible.

"8. Do not remove supports under concrete slabs or girders until the concrete has reached a final set. This may require several months time if the weather is cold.

"9. Remove all ice or snow from the reinforcing steel and forms before placing the concrete. Care should also be taken to prevent chunks of snow or ice from becoming mixed with the concrete aggregate.

"10. Alternate freezing and thawing before the concrete has finally set up will destroy the bond between the cement and the sand and stone pebbles in the concrete and render the concrete useless. Concrete which has been frozen if thawed out and allowed to set up before again freezing will have practically the same strength as concrete which has set under normal conditions."

Conclusions Drawn from Tests of the Toughness of Bituminous Aggregates

An investigation of the toughness of bituminous aggregates made by Chas. S. Reeve, Chemist, and Richard H. Lewis, Assistant Chemist, Office of Public Roads and Rural Engineering, U. S. Department of Agriculture, is described in a recent reprint from the "Journal of Agricultural Research," for Aug. 13, 1917.

The investigation was instituted, according to Messrs. Reeve and Lewis, the authors of the article, "as a result of certain observations on the part of one of the authors through an extended inspection of a large mileage of bituminous concrete roads in New England. The mixes were largely of the one-size stone type, using crusher run of approximately the size that would pass a 1¼-in. screen and be retained on a ½-in. screen. The predominating rocks used were field stone of granitic or gneissoid character. The exceptions were a few sections constructed with quartzite or trap rock. Coal-tar binders were used almost exclusively in this work, and in most cases they were fluid products of about the consistency commonly required for hot surface applications.

"The careful inspection of a large mileage of roads constructed by the mixing method with the materials above noted showed conclusively a more pronounced and frequently quite rapid failure of sections in which trap rock or quartzite was used than in those sections constructed with native field stone. In fact, the difference in behavior was so marked that one engineer ventured the observation that trap rock was not adapted to bituminous construction. The excellent behavior of the tar trap rock sections constructed by the same method and exposed to heavy traffic at Jamaica, N. Y.,[*] offered positive evidence to the contrary, although it is to be noted that a heavier grade of tar product was used than had been the case in the New England work. There appeared, however, to be no room for doubt that various rocks behaved differently in combination with the same bitumen, and it was in an endeavor to determine, if possible, what particular characteristic was responsible for the difference in behavior that the experimental work described in this paper was undertaken."

The tests were made on a large number of rock samples, in which were included rock of the kind that had been under observation in the construction referred to above. They were crushed to sizes ranging from ¼ in. to dust, screened into different sizes and recombined in predetermined proportions. The aggregate so prepared was heated and mixed with bituminous materials and the mixture made into cylindrical test pieces 25 mm. long and 25 mm. in diameter.

The bituminous binders used were two grades of refined water-gas tar, a residual petroleum, an oil asphalt and a fluxed native asphalt.

In the reprint ("Toughness of Bituminous Aggregates") which was noted brefly in "Good Roads" for Nov. 24, a very detailed description of the materials and testing methods employed is given. The conclusions reached by the investigators are as follows:

"(1) The toughness of bituminous aggregates in which a given bituminous material is used will not be the same for every type of rock.

"(2) Tests of laboratory specimens can be directly correlated with results in service.

"(3) The difference in behavior of the various rock types can not be directly attributed to any of the routine physical test values of the rock, but appears to be due largely to differences in the surface character of the rock particles.

"(4) While relatively soft or fluid bitumens may yield satisfactory results in bituminous concrete with some types of rock, their use with other types will lead to failure of the road surface.

"(5) The impact or toughness test of bituminous aggregates offers possibilities as a means of determining in advance the relative behavior in service of bituminous concretes. While the authors at this time have no definite recommendations to offer with regard to their last conclusion, it may be stated that further experiments will be made with that end in view."

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[*] "Progress Reports of Experiments in Dust Prevention and Road Preservation, 1911," U. S. Dept. Agr. Off. Pub. Roads Circ. 98, 47 p. 1912.

Highways Transport Committee Planning for Motor Truck Hauling

As the first step in its work of relieving railroad congestion by the utilization of the highways for freight transportation, the Highways Transport Committee has sent out from a city in the middle west a pathfinding truck to select a route to the Atlantic coast.

Roy D. Chapin, chairman of the committee, is said to have stated that within a few weeks the route chosen will be tested by an army truck train. If this test proves satisfactory, according to report, the route will be used for bringing to points of embarkation for France some ten thousand trucks for which contracts are now being awarded by the Government. The first truck train is to consist of 27 cargo trucks, 2 trucks carrying gasoline, 1 for baggage and rations, 1 kitchen truck, 1 light repair truck, 2 motorcycles and 1 officers' car. The force will consist of a lieutenant and 76 men.

The pathfinding car will be accompanied through the various states by representatives of the state highway departments.

It is understood that the trucks sent to the coast under their own power will carry capacity loads of supplies. This plan will relieve the railroads of thousands of tons of freight and will afford an opportunity for the training of drivers.

Supervisors of All Iowa Counties Traversed by the Lincoln Highway are to meet at Marshalltown on Dec. 7. The meeting, which was called by the supervisors of Linn, Benton and Tama Counties, will be devoted to a discussion of ways and means of making permanent and uniform improvements on the road in the several counties.

The Improvement of Lafayette St., in Beardstown, Ill., Will Be Undertaken in Spite of the War and the resulting unfavorable conditions. Favorable action on the proposition was taken recently by the Board of Local Improvements at an executive session following a protracted and heated discussion. The petition for the work is said to have been circulated previous to this country's declaration of war, and some of those who signed it felt that the work should be postponed until after the war. The board passed the favorable vote unanimously. The street to be paved is 15 blocks long, and extends from the Illinois River to the south end of the town.

Linn and Black Hawk Counties, Iowa, plan to expend for road work in 1918 the sum of $500,000, exclusive of the expenditures from regular county funds. At a joint meeting of officers of the Cedar Rapids Commercial Club, the Marion Commercial Club, the Kenwood Commercial Club, the Linn County Board of Supervisors, and representatives of the State Highway Commission a fund of $256,000 was pledged. Later a board of these representatives from the commercial and other organizations concerned was named to act with the county authorities in administering the funds. It has been agreed that no action can be taken except by a majority of the combined boards. In case of failure to agree, the State Highway Commission is to decide. The amount to be spent in Black Hawk County is $244,000.

Gauging Rivers in Study to Prevent Bridge Losses in Western Iowa Floods*

Sites for six river gauging stations have been located by engineers from the State Highway Commission and the U. S. Geological Survey on western Iowa streams where flood waters are continually causing heavy bridge losses. These stations are to be established for the purpose of gathering data on flood run-off to aid in determining actual sizes of bridge openings necessary to carry flood waters on these particular streams. The stations will be located at or near:

Correctionville, on the Big Sioux River.
Woodbine on the Boyer River.
White Cloud on the Nishnabotna River.
Red Oak on the east fork of the Nishnabotna River.
Clarinda on the Nodaway River.
Davis City on the Grand River.

Western Iowa has been a heavy sufferer from flood damage. Counties through which these and other of the western Iowa rivers flow, have lost bridges by the dozens year after year. Losses have been recorded totalling $60,000 to $75,000 in single counties for a single flood. The January flood of 1916, as an illustration, when a warm period caused the melting of a thick mat of snow over the entire section of the state, sent unprecedented volumes of water down these river valleys. Rivers which in ordinary times could be waded safely by a child, became, in a few hours, raging torrents miles wide, and continued so for days. Pottawattamie, Harrison and Mills Counties lost bridges which required more than the total of their bridge funds for the year to replace. Nearly every western Iowa county has had similar experiences.

It is these losses recurring year after year which have determined the Highway Commission to make special investigation of the entire drainage problem on these streams. The State Geological Survey, in connection with the U. S. Geological Survey, has been carrying on similar investigations for a number of years in the eastern and central portions of the state. That work is being continued, but lack of funds has prevented the extension of the work to these new sections. The commission and the U. S. Office of Public Roads will cooperate in gathering the data at the new station to be established, each sharing the expense The sites for these gauging stations have been chosen at points where the entire flow of the river is constricted by embankments to single bridge openings. A graduated foot scale will be securely and permanently attached to a bridge pier or abutment. The local man engaged to make the readings each day, lowers a weight until it touches the water and he then records the height of the water. From time to time, on telegraph call from the local observer, when the water is at varying levels, engineers from the Highway Commission office will make accurate current meter measurements of the amount of the flow. This will consist in determining accurately by means of special instruments and devices supplied by the U. S. Geological Survey, the velocity of the flow and by actual survey the area of the portion of the opening then being used by the flood water. From this can be computed, the amount of water per second or minute passing through the opening at that particular stage of the water. After a number of these measurements at different water levels, it will be possible for those in charge to determine from the gauge readings just what the actual amount of the flow is for each stage of the flood.

There are many counties in Iowa which have a serious problem in determining what to do with their rivers. Many counties have resorted to straightening of the channel on the theory that there would be less flood damage if the water had a straight-away course to get through the county. Usually this affords relief until the stream, in the course of time, remakes itself a channel to its own liking, sometimes as crooked as the original. The county that, acting entirely alone, relieves itself from flood damage by channel straightening, usually simply transfers its own flood troubles upon the county below it. The county below has its flood troubles doubly increased and its relief can come only by continuing the channel straightening process and throwing the water upon the territory below.

The character of the soil in western Iowa is such that it is difficult to control the channels of the streams. In fact, the channel shifts so frequently from point to point, deepens itself and becomes shallow again with such frequency, that the choice of gauging sites has been rather difficult. W. G. Hoyt, District Engineer of the Water Resource branch of the U. S. Geological Survey, and R. W. Clyde, Drainage Engineer for the State Highway Commission, made the reconnoisance over the territory and established the sites for the stations. Points have been selected where it is believed the natural channel changes will be slight during the period of the investigation. While the commission is interested and is participating in the gathering of the data chiefly because of the flood flow measurements and the value of such measurements to the bridge building interests of the state, the data gathered will provide information for a great deal of use later in drainage, flood control and water power development along these special streams.

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* From the "Service Bulletin," the official publication of the Iowa State Highway Commission, Vol. V, No. 10, October, 1917.

A Revision of Taxable Property Valuations in Pennsylvania Recommended

A revision of the method employed in fixing county tax valuations would result in an increase in the total valuation in many counties, making it possible to provide larger sums of money for road building purposes and at the same time reducing the tax rate, according to State Highway Commissioner O'Neil of Pennsylvania, who has recently completed a tour of a number of counties of that state.

It is stated that in many instances the assessments are not only too low but are not equitable, and that there is no uniformity of assessment for taxation purposes, in some counties the basis of valuation being fixed at 80% and in others as low as 50%. To remedy this inequality, Commissioner O'Neil suggests either the creation of a Board of Tax Revision, or the appointment of assessors by the county commissioners and the subsequent adoption of a system whereby uniform assessments could be made. This, it is believed, would avoid discrimination in fixing the value of property valued at $2,500 or $3,000 which usually represents the real values, and property worth $200,000 and assessed at $110,000. A uniform system of valuation would result in an increase in valuation of from 40 to 50%, a larger revenue, and lower tax rate.

Commissioner O'Neil is of the opinion that road building is an important economic problem, and that improved roads are an absolute necessity if the people are to be kept on the farms for the production of foodstuffs.

It is expected that $3,500,000 will be realized from automobile licenses during 1918, all of which will be applied to the maintenance of roads already built.

Utah Counties to Join in Building Roads

For the purpose of developing an intercounty highway system and especially to secure the construction of an improved highway making the Grand Canon of the Colorado accessible to tourists the counties of Iron, Garfield, San Juan, Kane and Washington in Utah have formed an association and established headquarters in Garfield County.

Bids to Be Asked for Graveling Large Mileage in Franklin County, Washington

About the middle of December the highway authorities of Franklin County, Washington, will call for bids for the graveling of approximately 30 mi. and for grading and graveling 7 mi. of highway in that county, according to advices just received from J. W. Ketner, County Engineer, of Pasco, Wash. Franklin County is in the southeastern part of the state.

Proposed Highway Expenditure in Minnehaha County, South Dakota

It is expected that highway work costing upward of $50,000 will be done in Minnehaha County, South Dakota, next year, according to advices from that state.

The highway funds will be derived from taxation and federal aid in equal amounts. The plan under which this sum will be spent is a part of a ten-year program which the county will carry out for the permanent improvement of its roads.

Atlanta-to-Macon Highway Improvement to Begin in January, 1918

According to an announcement of the Georgia State Highway Commission, the actual work of improving the highway between Atlanta and Macon will be commenced by Jan. 1, 1918.

The preliminary work on the road is that of making cross-sections of the grading over the entire distance. An effort to put the road in passable condition for at least a part of the winter will be made.

Relieving New York Streets of Litter

The work of the Anti-Litter League in New York City has been taken over by the Merchants' Association which has selected the Third Police Inspection District for demonstration work. This district, which includes five police precincts, is the area between the north side of 14th St. and the south side of 42d St., from the Hudson River to the East River. The portion of the city included within these boundary lines has a total population of about 500,000, and may be said to be a typical section of the city, as it contains both retail and wholesale business houses and a variety of industries, many hotels and theaters, and shipping terminals on both rivers.

The plan of the Committee on City Conditions of the Merchants' Association is to make this a model district for other districts to follow as the anti-litter work progresses to other portions of the city. Block captains chosen from the public schools, who will have charge of the inspection of several blocks, will mail monthly reports of street conditions in their districts to the above named committee. The police, street cleaning and other departments of the city government, as well as a number of civic associations will cooperate in the work. Hotels will also be asked to aid the cause.

One of the duties of the block captain, according to the Bulletin of the Association, will be to request workers who spend considerable time on the streets during the noon hour to refrain from scattering paper wrappings and remnants of food on the sidewalks and street pavements.

Hillsboro County, Florida, to Vote on Road Bond Issue

Automobile and other organizations are giving strong support to the proposal to issue road bonds for the improvement of about 60 mi. of highway in Hillsboro County, Florida, and are doing much to bring about the success of the election which will occur Dec. 18. The amount to be voted upon is $875,000.

It is stated as an argument in favor of the issue that Hillsboro County has no improved road extending to the county line, although adjoining counties have completed or are constructing highways to their respective limits and expect that Hillsboro County will do its part to provide a system of intercounty highways.

The roads that are considered to be of first importance in the matter of improvement are Howard Ave., Tampa, to the Pinellas County line, the road from Sulphur Springs to the Pasco County line, the road from Knights Station to the Pasco County line, the road from Plant City to the Polk County line, the road from Cornet to the Polk County line, and the road from Riverview to the Manatee County line. These highways will connect with the main routes of the adjoining counties.

State and Federal Aid Mileages in Wisconsin

The trunk roads that are to be improved by funds received from the state and federal governments have been laid out by the Wisconsin State Highway Commission, comprising a system of approximately 5,000 mi. The counties benefited and the number of miles to be constructed therein are as follows:

Adams, 74.37; Ashland, 84.50; Barron, 90.03; Brown, 70.05; Buffalo, 99.58; Burnett, 37.39; Calumet, 64.75; Chippewa, 82.80; Clark, 81.60; Columbia, 97.73; Crawford, 65.60; Dane, 154.57; Dodge, 95.57; Door, 41.85; Douglas, 66.24; Dunn, 42.35; Eau Claire, 81.20; Florence, 34.45; Fond du Lac, 85.99; Forest, 65.12; Grant, 108.93; Green, 56.78; Green Lake, 46.51; Iowa, 65.96; Iron, 54.62; Jackson, 66.09; Jefferson, 75.86; Juneau, 85.46; Kenosha, 36.50; Kewanee, 51.85; La Crosse, 48.20; LaFayette, 65.57; Langlade, 32.29; Lincoln, 41.85; Manitowoc, 78; Marathon, 105; Marinette, 60.97; Marquette, 41.12; Milwaukee, 69.94; Monroe, 74.77; Oconto, 68.56; Oneida, 114.14; Outagamie, 50.95; Ozaukee, 35.45; Pepin, 26.60; Pierce, 53.05; Polk, 71.40; Portage, 75.94; Price, 83.37; Racine, 67.60; Richland, 75.90; Rock, 79.04; Rusk, 73.96; St. Croix, 66.45; Sauk, 106.30; Sawyer, 57.95; Shawano, 103.17; Sheboygan, 69.61; Taylor, 25.80; Trempealeau, 91.21; Vernon, 62.03; Vilas, 63.45; Walworth, 90.81; Washburn, 74.29; Washington, 64.60; Waukesha, 74.06; Waupaca, 80.61; Waushara, 98.57; Winnebago, 30.89; Wood, 68.55.

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The Offer to Build a State Highway in Delaware, which was made by T. Coleman du Pont to the state several weeks ago, has been accepted by the State Highway Board upon the recommendation of Attorney General Reinhardt. The work of building the road is to be done without cost to the state.

The Paving Commission of Baltimore, Md., reports that it has laid 150 mi. of new pavement in that city since the commission was appointed in the spring of 1911. The amount expended was $6,500,000. It is stated that 80% of the pavement laid was sheet asphalt. The overhead expenses including salaries were about 5% of the whole expenditure.

The Public Highways of Allegheny County, Pennsylvania, are being greatly damaged by heavy motor truck traffic due to railroad congestion. It is said that some of the roads have been injured to such an extent by the hauling of coal and other commodities by dealers and producers that some road surfaces are dangerous for lighter traffic.

MEETINGS

Calendar of Coming Meetings

Dec. 4-6.—American Association of State Highway Officials.—Annual meeting, Hotel Jefferson, Richmond, Va. Acting Secretary, H. M. Berry, Chapel Hill, N. C.

Jan. 12, 1918.—Northwestern Society of Highway Engineers.—Annual meeting, Benson Hotel, Portland, Ore. Secretary, C. G. Reiter, Hillsboro, Ore.

Jan. 15-17, 1918.—Virginia Good Roads Association.—Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

Jan. 22-24, 1918.—American Wood Preservers' Association—Annual meeting, Chicago, Ill. Secretary F. J. Angier, Baltimore & Ohio Railroad, Mount Royal Station, Baltimore, Md.

Feb. 7-9, 1918.—American Concrete Institute.—Annual convention. La Salle Hotel, Chicago, Ill. Secretary H. B. Alvord, 27 School St., Boston, Mass.

Feb. 8-9, 1918.—American Concrete Pipe Association.—Annual convention. Sherman Hotel, Chicago, Ill. Secretary, J. H. Libberton, 208 S. La Salle St., Chicago, Ill.

National Paving Brick Manufacturers' Association

That road improvement was a war necessity and must be continued with all possible energy was the unanimous conclusion reached at the conference of the National Paving Brick Manufacturers Association at Cleveland, O., on Nov. 19 and 20, noted in last week's issue.

The following resolutions were passed unanimously:

BE IT RESOLVED: That there be a committee appointed by the president of the association, the membership thereof to include the president of the association and its secretary, and four other persons to be selected by the president, whose duty it shall be to represent the association industry in matters affecting the industry, arising out of any governmental relationship.

BE IT RESOLVED FURTHER: That in order to increase the effectiveness and influence of the association in all matters affecting the welfare of the paving brick industry, the membership committe be increased to five in number, the secretary ex-officio to make the sixth member thereof, and that this committee be charged not only with actually securing memberships in the association, but that they be and are hereby specially charged with seeking conferences with allied and local associations for the better correlation of efforts, unity of action, and especially a finding out of reasons, if any there be, why any single manufacturer or group of manufacturers remain out of membership in the national association. In connection with this duty the special purpose therefor is found in the great necessity for the amplification of funds for an effective advertising campaign.

The Committe on Government Relationship is as follows: C. C. Blair, Canton, O., W. P. Blair, Cleveland, O., J. W. Sibley, Birmingham, Ala., W. G. D. Orr, Galesburg, Ill., A. L. Shulthis, Independence, Kan., and R. T. Hutchins, Wheeling, W. Va.

Reports from over one thousand cities and from various states, presented at the conference, indicated that over seventy-five per cent. of the number heard from favored the prosecution of road and street work as being of the utmost importance.

The annual meeting of the Rockland County Good Roads Association was held at Nyack, N. Y., Nov. 16. A favorable report was made by Senator Blauvelt on the building of Route 3. The following officers were elected: President, A. S. Thompson, Nyack; Vice President, G. Briggs Buchanan, Haverstraw; Secretary, Natalie F. Couch, Nyack; Treasurer, A. M. Voorhis, Nyack.

PERSONAL NOTES

J. F. Bowan has been reappointed City Engineer of Manchester, Conn.

J. J. Lavery, at one time City Engineer of White Plains, N. Y., has been appointed City Engineer of Summit, N. J.

J. Manwaring has been appointed County Engineer of Silverbow County, Montana, succeeding Charles M. Feeney, deceased.

L. M. Russell, City Engineer of Elkhart, Ind., has resigned, effective Dec. 1, to become associated with Arthur J. Sweet, Consulting Engineer of Milwaukee, Wis.

Alfred D. Butler, Assistant City Engineer of Spokane, Wash., has been made City Engineer, succeeding Morton Macartney, who resigned to enter private practice.

Walter C. Daniel has been appointed an assistant engineer of the Tennessee State Department of Highways. Mr. Daniel was formerly Assistant County Engineer of Hamilton County, Tenn.

H. B. Alvord for the past three years connected with the Aberthaw Construction Co., of Boston, Mass., has succeeded Harold D. Hynds as Secretary of the American Concrete Institute. Mr. Alvord's office is at 27 School St., Boston.

Prof. R. C. Yeoman, Dean of the Engineering Department of Valparaiso University, has been appointed Assistant Professor of Highway Engineering at Purdue University, effective Dec. 1. He succeeds Prof. G. E. Martin, now with the U. S. Engineer Corps.

Harold D. Hynds, who, as noted in the issue of October 27, recently became associated with the Turner Construction Co., of New York, has joined the Signal Corps of the U. S. Army. Mr. Hynds has resigned the office of Secretary of the American Concrete Institute.

Thomas W. Cothran, a civil engineer of Greenwood, S. C., has been appointed by Governor Manning as Chairman of the State Highway Commission to succeed Major J. Monroe Johnson who is now on military duty as head of the South Carolina battalion of engineers.

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Contracts for Grading on Pennsylvania Highways may be let separately from other construction work next year, owing to advanced prices and the difficulties in securing labor and material, according to report.

A State Road from Jacksonville to Pensacola, Fla., following the old Spanish trail, is among the highway improvement plans of the state for the application of federal aid. It is reported that the state will give $30,000 toward the project the first year, the government $10,000, and Duval County $10,000; also that the West Coast counties will lend support to the proposed highway.

The Work of Widening Washington Ave. in St. Louis, Mo., will be started next spring, according to a recent announcement. The proposed improvement extends from Jefferson Ave. to Grand Ave. The work was provided for five years ago by the passage of an ordinance, but has been held up by legal proceedings. The present width of the street is 60 ft., and this will be increased to 80 ft.

Attorney General E. T. England, of West Virginia, in construing the good roads law of the state, has declared that no contract for the construction of any highway or part of a highway in West Virginia can lawfully be awarded until after public advertisement has been made of the intention to let the contract, indicating the materials to be used. Apart from the meaning of the road law, he says that public policy and the general laws would demand that such notice be given.

GOOD ROADS

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Number 23

The Storm King Road

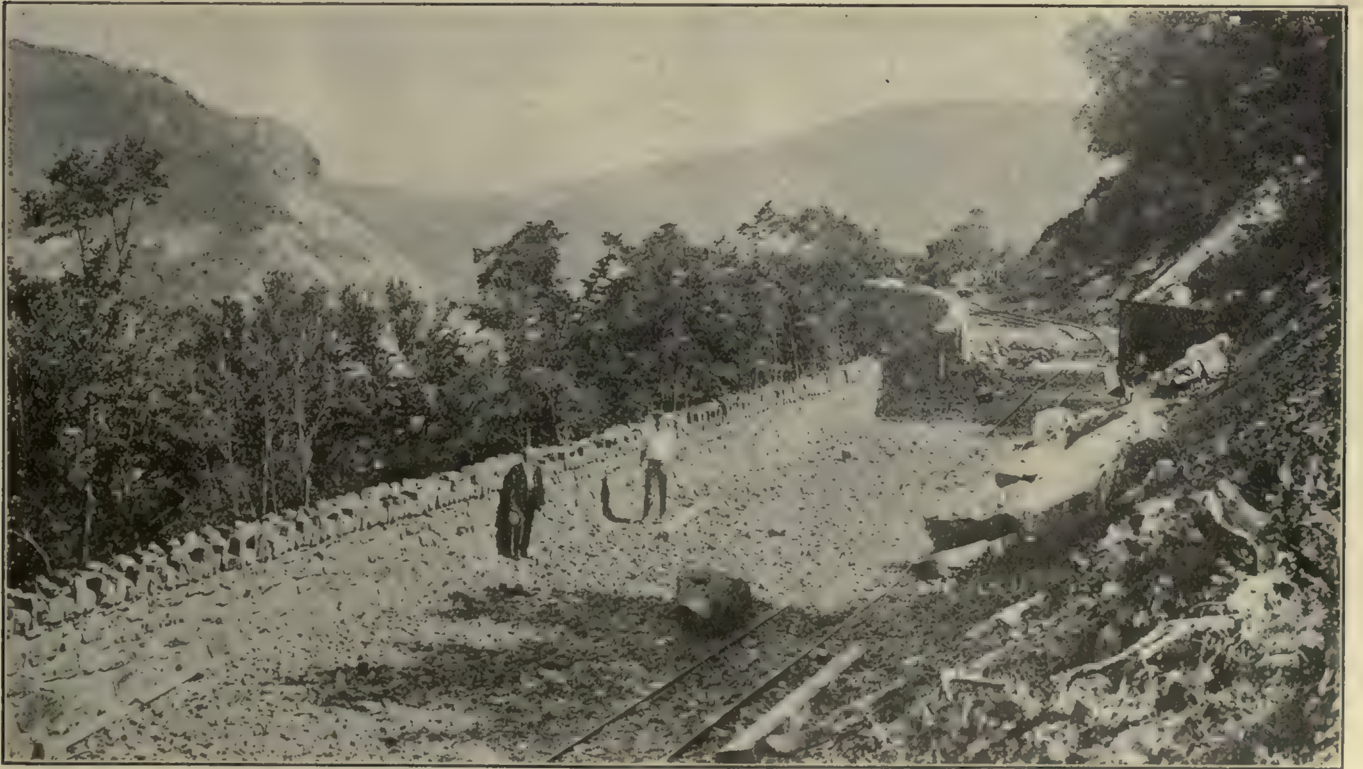
By H. E. BREED*

The advantages to be gained from an undertaking should be greater than the difficulties it opposes. The building of the Storm King Road is the biggest and hardest piece of work ever attempted by the Highway Department of New York State. We believe it will be justified by helping to solve our traffic problem along the river routes.

The Storm King Road, officially known as the West Point-Cornwall State Highway No. 5498, is part of State Route No. 3 that parallels the west bank of the Hudson River between New York and Albany. This route is now abruptly broken at West Point and the only connection further north is over a rough and dangerous mountain path to Cornwall. The building of the Storm King Road, with a few other links already planned, will complete the route.

Commercially, the completed route will be of great value. It will shorten the highway distance between New York and Albany; it will give two routes south from Newburgh through a district badly congested now with military traffic; and with other important routes, it will give through connections east and west. It intersects, at Highland Falls, Roue 4, which passes through Orange and Sullivan Counties, along the Susquehanna and Delaware Rivers, through the entire "southern tier" and on past Lake Chatauqua to the Pennsylvania line at Lake Erie. At Albany it connects with Routes 1 and 2 on the east side of the Hudson, with Route 21 leading into Massachusetts, with Route 25 leading north to Montreal, and with Route 6 now continuously improved from Albany to Buffalo.

At Bear Mountain Park on the south, Route 3 connects with the roads built by the Interstate Palisades Park Com-



VIEW ON THE STORM KING ROAD—CORNWALL-WEST POINT ROAD, PART 1, STATE HIGHWAY NO. 5498, ORANGE COUNTY, NEW YORK—VIEW LOOKING SOUTHERLY FROM STATION 20—BREACKNECK MOUNTAIN, ON THE OPPOSITE SIDE OF THE HUDSON RIVER, AT THE LEFT.

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*First Deputy Commissioner, New York State Commission of Highways.

TAKING A CROSS-SECTION AT STATION 38—VIEW LOOKING NORTH—BANNERMAN'S ISLAND IN NEWBURGH BAY SHOWN IN THE RIGHT BACKGROUND.

mission, leading over the mountains to Tuxedo. The scenery through this part of the Hudson River country is so glorious that Route 3 will disclose rare possibilities of aesthetic enjoyment to the tourist. The section around Storm King marks the climax of its beauty.

The road has had an interesting history. More than forty years ago a project to build a road around Storm King failed for lack of capital. Fifteen years later a few surveys were made, and then in 1903 came the original petition to the state. In 1904 the survey was begun.

The original survey was made almost wholly by the stadia method and the contour map on which contours were placed at 2-ft. intervals except where the steepest slope was placed, and there the interval was 10 ft. From this map the location was worked up. It is an interesting fact that the present center line of the roadway approximates the original line very closely for the greater part of the distance.

In the original design the maximum grade limit was 5%; the minimum radius of curves 150 ft. One section closely resembled the Axenstrasse over the Swiss Alps with a thousand feet of gallery construction where the roadway would be tunneled out of the side of the mountain and opened up toward the river, the roof being supported by stone columns. At the end of this, across the nose of Storm King, where the rock is badly shattered and faulted, there was provided a tunnel, 700 ft. long, to put the roadway in safe rock. The gallery and tunnel construction was necessitated because the plans were prepared on a grade limit of 5%, and as the southern face of Storm King practically rises sheer 360 ft. from the river and is badly shattered near the surface, there was no possibility of placing the road along the face except at extraordinary expense.

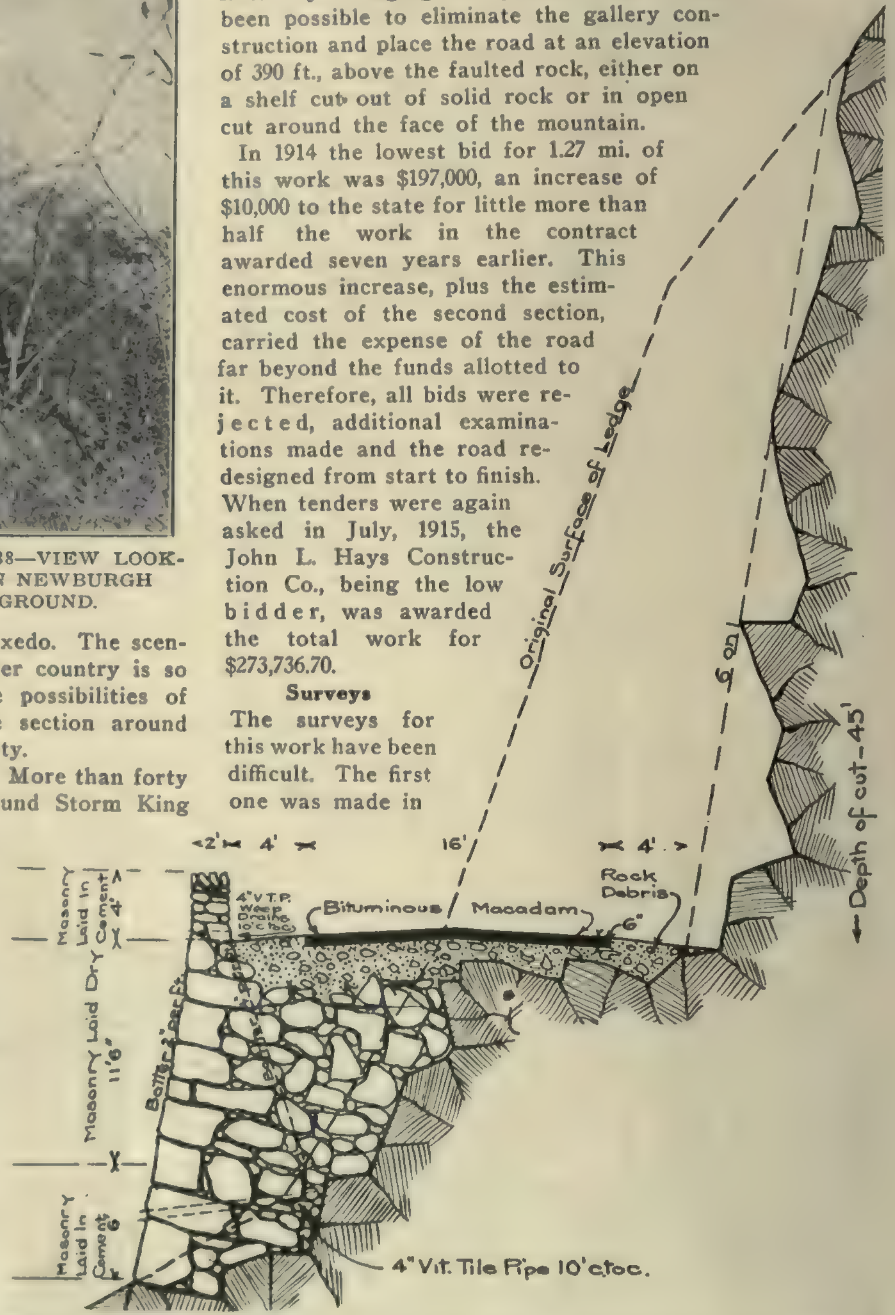
Some additional provisions were made in the plans and a contract was prepared for 2.31 mi. of this section of road and was awarded on Dec. 2, 1907, for $187,000. Work was started and some grading done when a taxpayer's injunction was procured to stop the work. And thereby hangs a tale.

Fresh interest was aroused and a new survey made in 1913. By changing the grade to 7% it had been possible to eliminate the gallery construction and place the road at an elevation of 390 ft., above the faulted rock, either on a shelf cut out of solid rock or in open cut around the face of the mountain.

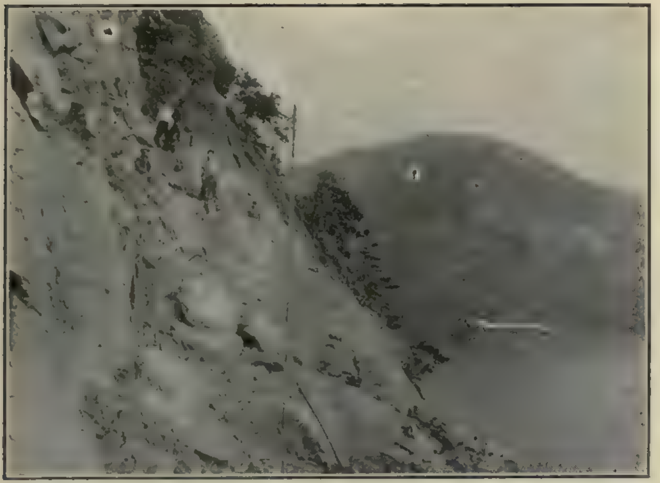
In 1914 the lowest bid for 1.27 mi. of this work was $197,000, an increase of $10,000 to the state for little more than half the work in the contract awarded seven years earlier. This enormous increase, plus the estimated cost of the second section, carried the expense of the road far beyond the funds allotted to it. Therefore, all bids were rejected, additional examinations made and the road redesigned from start to finish. When tenders were again asked in July, 1915, the John L. Hays Construction Co., being the low bidder, was awarded the total work for $273,736.70.

Surveys

The surveys for this work have been difficult. The first one was made in February and March, when the mountain was covered with ice and snow, so that it was necessary for the men to work all the time with life belts and on ropes. Some accidents happened, but none were serious. On account of the unbroken country, the stadia method was determined upon as being most adequate and best fitted closely to represent actual conditions.


Original Surface of Ledge
6 on 1
Depth of cut - 45'
2'
4'
16'
4'
Rock Debris
4" V.T.P. Weep Drains 10' c. to c.
Bituminous Macadam
6"
Masonry Laid in Cement 4'
Masonry Laid Dry 11'6"
Masonry Laid in Cement 6'
Batter 2" per ft.
Batter
4" Vit. Tile Pipe 10' c. to c.

TYPICAL SECTION IN AVERAGE LEDGE CUT—STATION 50+56—STORM KING ROAD.



STORM KING ROAD—VIEW LOOKING NORTHEASTERLY AT STATION 42—CUT PARTLY MADE.

One of the engineers who afterward had charge of this work was doubtful how accurate a stadia survey could be and therefore caused a part of the rough work to be actually run by the base line and cross-section method. When it had been plotted, the profile was laid upon a plotted profile of the old stadia work and there was so little difference between the two that the far greater advantages of the stadia method were chosen for future work.

Some unusual methods were used to cover inaccessible points on the mountainside. Although the face has an almost sheer drop at certain points, it is so irregular that it cannot be located by points taken at the top and bottom of the slope. In order to represent this properly on paper, triangulation was used by placing two transits on the track on an accurately measured base and taking observations on points that could be easily distinguished. As this did not cover the whole area involved, it was thought advisable to find some supplementary method. The authorities at West Point were consulted, and after trying two or three experiments it was decided that some of these points could be marked with rockets. Each rocket was made with a bottle holding red and white lead fastened at its head. These were fired at the points on the mountain and, after some practice, it was found that through them the necessary information could be secured. On one of the later surveys the men used a target, which was dragged over the face of the cliff and raised or lowered at the desired point, when it was bisected by two transits on a measured base on the railroad tracks and by an additional transit used as a check on the mountainside.

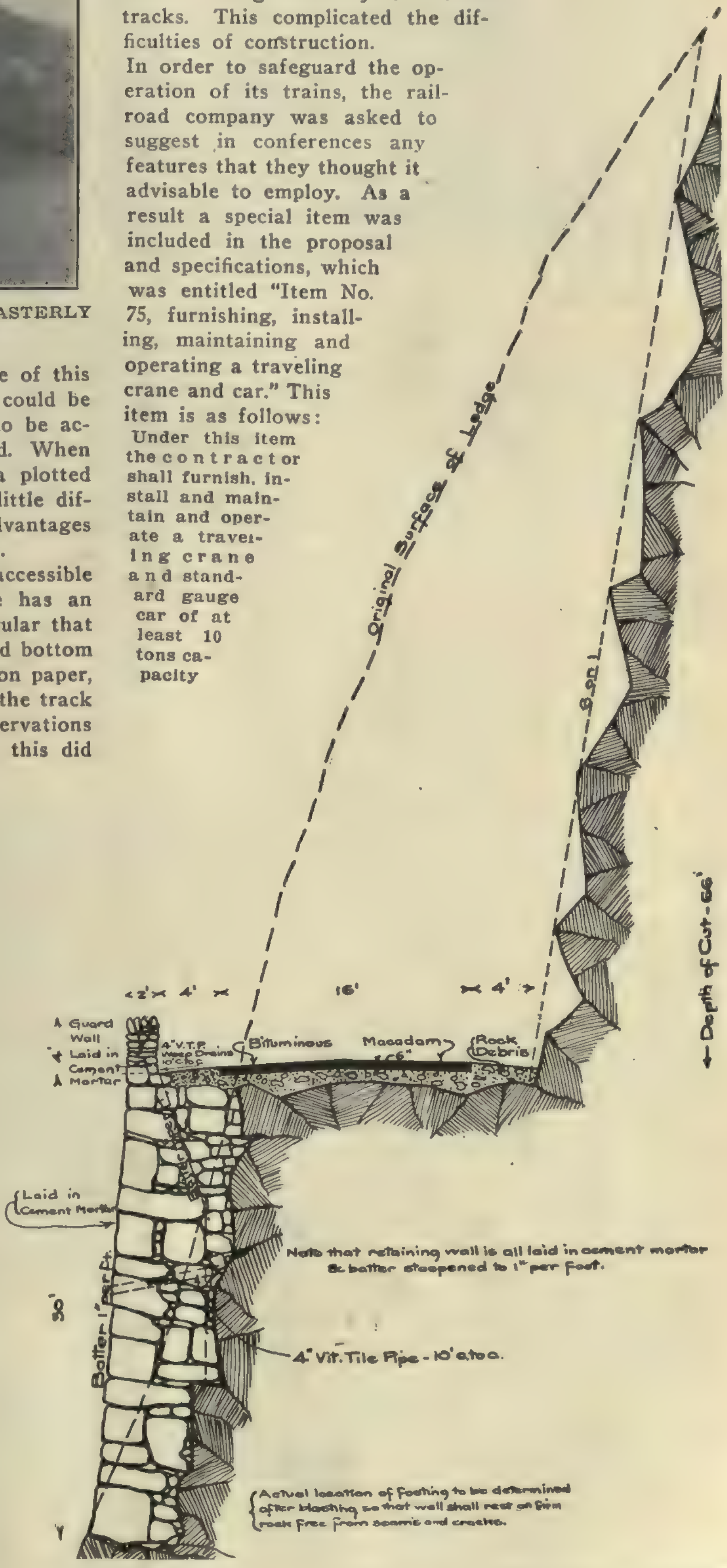
Final Plans and Specifications

The roadway when completed will be 24 ft. wide with a 16-ft. bituminous macadam pavement. The road is from 250 to 400 ft. elevation above the river all along the mountainside. The minimum radius of curvature is 200 ft. The greatest depth of rock cutting is about 130 ft., measured on the inside ditch line of the roadway to the top of cutting. The highest piece of retaining wall is about 50 ft.; the deepest fill, which contains almost 40,000 yd. of material, about 75 ft. There are 119,000 cu. yd. of excavation, 50,000 cu. yd. of ledge rock, and 25,000 cu. yd. of stone masonry. Some of these items will be considerably increased because the unstable nature of the rock requires that much that has been shattered by erosion must be removed lest it fall from time to time and impair the safety of the work.

The West Shore Railroad runs at the foot of the mountain almost directly under the road, so that anything started above will go directly on to the tracks. This complicated the difficulties of construction.

In order to safeguard the operation of its trains, the railroad company was asked to suggest in conferences any features that they thought it advisable to employ. As a result a special item was included in the proposal and specifications, which was entitled "Item No. 75, furnishing, installing, maintaining and operating a traveling crane and car." This item is as follows:

> Under this item the contractor shall furnish, install and maintain and operate a traveling crane and standard gauge car of at least 10 tons capacity


Original Surface of Ledge
S.90 L.
Depth of Cut - 66'
2' 4' 16' 4'
Guard Wall Laid in Cement Mortar
4" V.T.P. Weep Drains 10' c. to c.
Bituminous Macadam
6"
Rock Debris
Laid in Cement Mortar
Note that retaining wall is all laid in cement mortar & batter steepened to 1" per Foot.
30'
Batter 1" per Ft.
4" Vit. Tile Pipe - 10' c. to c.
Actual location of footing to be determined after blasting so that wall shall rest on firm rock free from seams and cracks.

TYPICAL SECTION, SHOWING DIFFICULT CONSTRUCTION—STATION 44+98—STORM KING ROAD.

RETAINING WALL UNDER CONSTRUCTION AT STATION 135 - STORM KING ROAD.

on the railroad track and spur at the foot of the mountain. He shall, for the full period of excavation and wall construction between certain stations, keep this equipment with an engineman and fireman operating it under necessary operating steam 24 hours of each day. He shall repair and replace the tracks, roadbed, rails, ties, etc., which may become injured under the operation of this contract. He shall install compressed air lines leading to the West Shore Railroad tracks, of sufficient capacity to furnish 300 cu. ft. of air at 60 lb. pressure to facilitate his removal of bowlders or rocks from the tracks. While the contractor is conducting his operations, work shall be done in such a manner that the safety and continuity of the operation of traffic by the West Shore Railroad shall be of first importance and shall at all times be protected and safeguarded. Work affecting the operation of the railroad shall be subject to the satisfaction of the operating company; and any watchman, operators, flagmen, etc., necessary to insure the safety of trains consequent upon the contractor's operations shall be acceptable to the railroad company and to the Commission of Highways, etc. A telephone shall be provided leading from the available points at which flagmen are to be located to the site of the operations on the mountain. A telephone connection is to be installed from the watchmen's post to the nearest train dispatcher's wire, so that communications may at all times be had with the superintendent of the railroad company, so that he may be advised when blasting or other operations affecting the safety of trains is being done.

Another special feature of the specifications is the provision with regard to excavation. It was perceived that if the excavation were classed in earth and rock, or earth, rock and bowlders, as would be natural, there would be possible frequent disagreements between the contractor's forces and the engineers as to just which classification should be paid for. To prevent such discussions and enable the contractor to bid more intelligently upon the work, it was classified by stations. Items 2, 2a, 2b, are as follows:

Item 2 shall include all bowlders and rubble irrespective of size, and shall include all material other than ledge rock to be excavated between Stations 51+18 and 57+86, etc.

Item 2a shall include all material other than ledge rock excavated between Stations 00 and 51+18, etc.

Item 2b shall include all material other than ledge rock excavation between Stations 189+86 and 212+61.

Rock Excavation

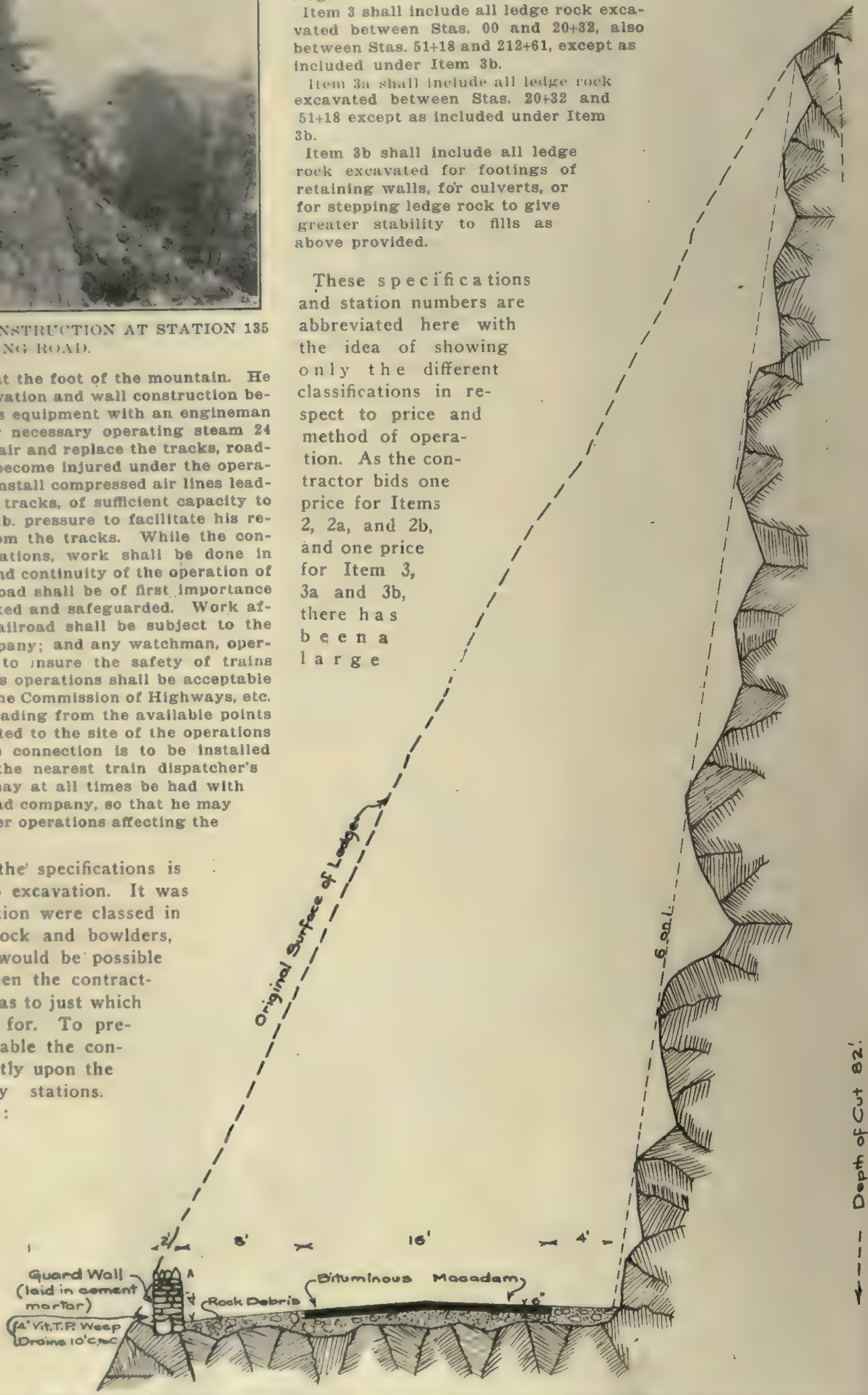
Under this item, no material other than ledge rock shall be included.

Item 3 shall include all ledge rock excavated between Stas. 00 and 20+32, also between Stas. 51+18 and 212+61, except as included under Item 3b.

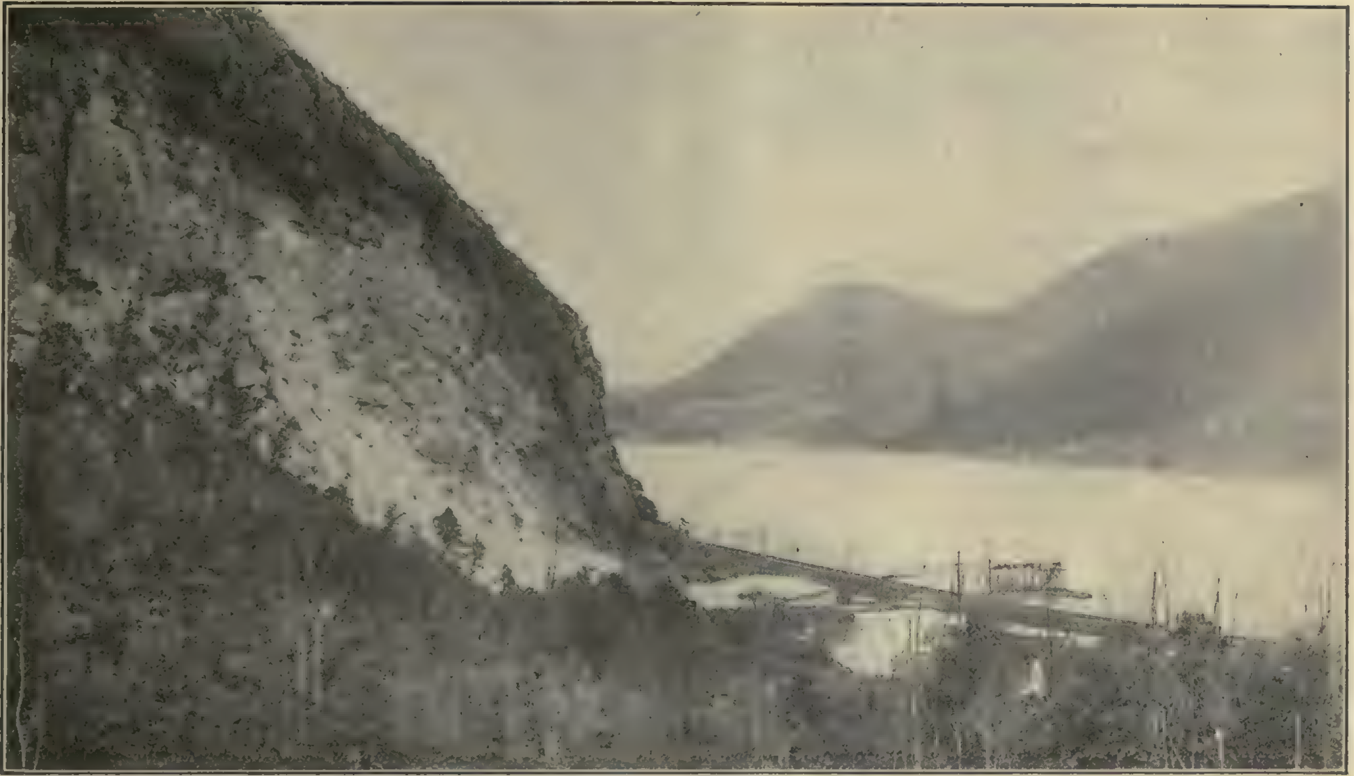
Item 3a shall include all ledge rock excavated between Stas. 20+32 and 51+18 except as included under Item 3b.

Item 3b shall include all ledge rock excavated for footings of retaining walls, for culverts, or for stepping ledge rock to give greater stability to fills as above provided.

These specifications and station numbers are abbreviated here with the idea of showing only the different classifications in respect to price and method of operation. As the contractor bids one price for Items 2, 2a, and 2b, and one price for Item 3, 3a and 3b, there has been a large


Original Surface of Ledge
6 on 1
Depth of Cut 82'
2'
8'
16'
4'
Guard Wall (laid in cement mortar)
4' Vit. T. P. Weep Drains 10' C. to C.
Rock Debris
Bituminous Macadam
6"

TYPICAL SECTION OF ROAD AROUND NOSE OF STORM KING MOUNTAIN—SHOWING ALL-CUT CONSTRUCTION IN LEDGE, ALSO WIDENING OF ROADWAY AT CURVE—STATION 42+06.



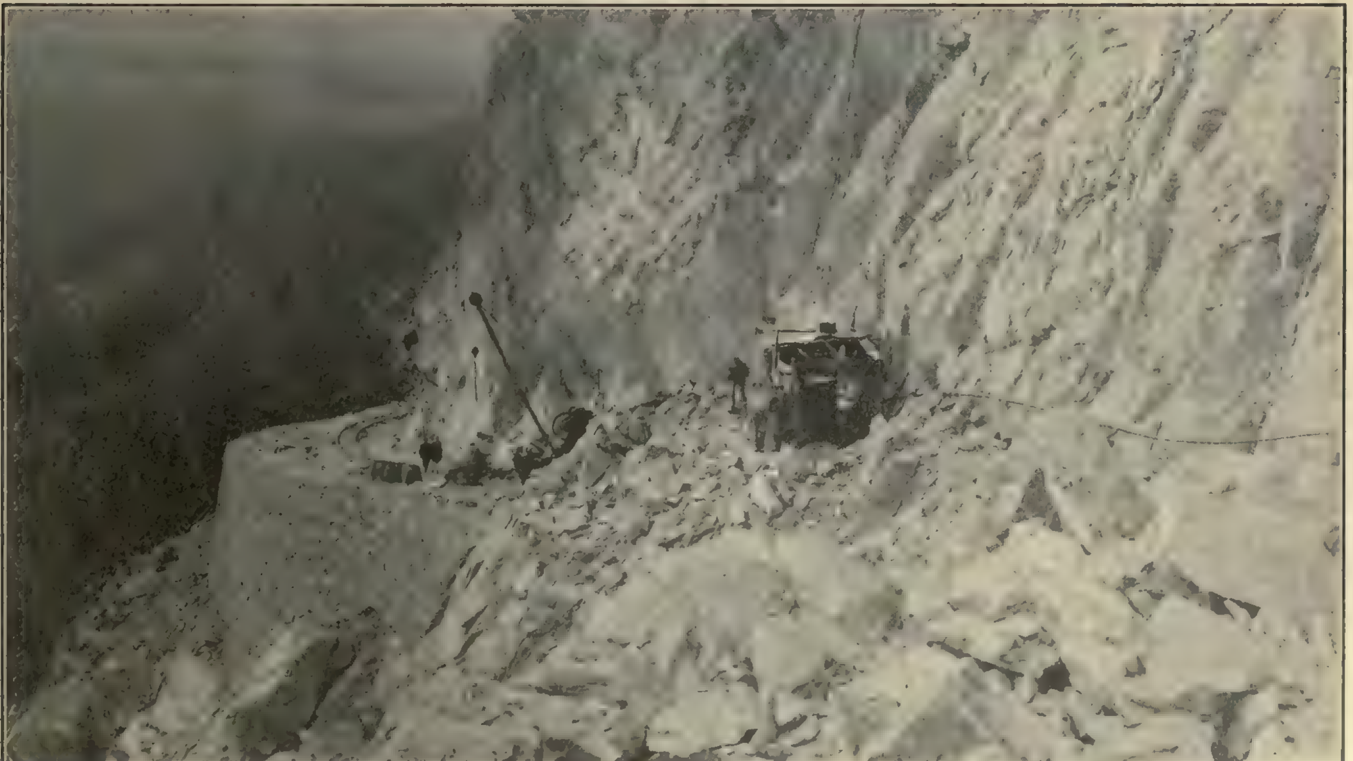
STORM KING MOUNTAIN—VIEW LOOKING NORTH FROM STORM KING ROAD—AT THE LEFT, ABOUT HALF WAY UP THE MOUNTAIN, IS THE RETAINING WALL ON THE OUTER EDGE OF THE ROAD, COMPLETED TO STATION 47.

saving in the amount of detailed engineering work and no disputes in regard to the classification of materials.

Plant and Equipment

A rought inventory of the plant on this work shows an investment of $57,000. At the prevailing prices it would probably cost from a third to a half more if it had to be procured for the work at this time.

The most valuable part of the plant is the compressor, which cost about $12,000 and was used by the Oscar Daniels Co. on the west Hudson River shaft of the aqueduct.



STORM KING ROAD—VIEW LOOKING SOUTHEASTERLY FROM STATION 46+50—AT THIS POINT THE ROAD IS ENTIRELY IN CUT AND THERE IS A SHEER DROP OF 200 FT.—A PARAPET WALL WILL BE BUILT ON TOP OF THE RETAINING WALL.

There are 27,000 ft. of pipe in use for the air lines to supply compressed air to different plant units and for drill purposes along the line of the work. This air line is carried along the railroad track, and risers at frequent intervals are attached to bring it up to the working level of the road.

Other large items of equipment are two cranes, one 5-ton and one 10-ton; one steam shovel; five 3-ton hoists, and 3 hand derricks.

To get the necessary plant in on the south side of Storm King Mountain, it was necessary to transport a 5-ton Wilson crane over the mountain at an elevation of nearly 1,300 ft. for a distance of about 7 mi. Other equipment had to be taken apart where it was unloaded from the freight trains, repacked piece by piece, and drawn up by the mules to the site of the work. The slopes are so steep that at most a team can draw up only 800 lb. on a stone boat. The cost of getting the crane in place was about $4,500.

Construction

The work comprises sidehill cutting in bowlders, earth or ledge rock in the inner half of the prism, and building the retaining wall and making the fill in the outer half. Where there is great depth of rock cutting, the operation is done by first suspending ropes from overhead, sometimes to a length of 200 or 300 ft., to which are attached scaffolds on which the drillers may work. After a depth of about 10 ft. has been drilled this material is blasted off, so that the men may drill the next bench. This in turn is blasted, until in the last bench the holes are drilled in from the surface so far that the corner piece will act as a buffer and retain sufficient material for the building of the walls and necessary fill. Because of the shattered condition of the face of the mountain, it is often necessary to go far outside of the prism line with the excavation and take out isolated sections of rock in order that the roadway may be made safe.

The rock is blasted in sections about 100 ft. long. The drilling is done by jackhammer and bull-nose drills, the former carrying ⅞-in. steel with a depth of hole of from 10 to 12 ft., while the latter carries 1½-in. steel and works to a depth of 16 ft. The average blast on this work has taken about 300 lb. of dynamite; the largest required about 600 lb.

After the work of blasting has progressed the wall gang follows, blasting out the wall footings and building the wall in sections. The wall is being built in eight different locations. In two, cranes are used, one a 5-ton and the other a 10-ton. In the others, derricks are employed. The wall footings are blasted out first and a thorough examination is made to see if any planes of cleavage have developed. Often it has been necessary to go down a second or third time in order to secure stable, solid rock as a foundation. On it is placed a masonary wall 4 ft. or more in height as the character of the work determines, and on this in turn is built a dry wall, the idea being that a dry wall would give drainage for the open spaces in the fill behind the retaining wall and allow the escape of water. This is brought up to about a foot below the elevation of the roadway, where again a masonry wall is built up into a parapet wall, which rises 4 ft. above the edge of the roadway. This parapet wall has, in place of a coping, sharp pieces of rubble set on end in cement mortar. These give a rustic appearance and will prevent the wall being used as a bench.

The retaining wall is built in sections from 10 to 30 ft. long and then the crane is moved up. Where the wall is of too great height to be built in one lift, it is built to a lower level, the crane raised and the upper lift or stage constructed.

The Contractor's Work

Up to Nov. 20, 1917, 62% of the work had been completed. The greater part of the most difficult work has been done, and enough of all classes of the work to assure us that there are no insurmountable problems.

At present the contractor is working at five different locations. The average number of men now employed is 65 of whom only 25 can be classed as common laborers, the others being above this rating both in pay and in work done. One great trouble of the contractor has been his inability to keep men on the work because of its dangerous character. They are afraid of the high points. One laborer even asked how much extra money he would get each day for climbing up and down to his job in addition to the work he did there. To save them a long walk along the railroad track, the contractor carries his men to and from the work in a gasoline launch, which gives easy access to all points along the river.

As his superintendent, the contractor has wisely employed an engineer. He also has a force of engineers who cross-section the completed work at the same time that it is being cross-sectioned by the state's representatives. Any arguments or disputes are settled on the spot. This has worked so well and has engendered such good feeling between the engineers and the contractor that it seems worthy of consideration on any work of large importance. In the office of the contractor there is an interesting profile and chart of the work, showing how far advanced it is and the amounts done of all the different items. This looks so encouraging that we hope now for the completion of the road during 1918.

Industrial School in West Virginia Trains Boys for Road Building

The West Virginia Industrial School, located at Pruntytown in Taylor County, has recently adopted an educational program which provides a practical course in road building. The course is intended to train the boys of that institution to do the actual work of construction, even that requiring some engineering skill.

The purpose of the school authorities is to interest the boys in road building so that they will desire to follow the work when released from the school. They are trained in the practical line of mixing and placing concrete, the laying and grouting of brick, and the operation of road machinery. If they become expert, or show unusual development, it is stated that the State Highway Commission would be able to recommend them for employment.

About half of the grading of a road from Fetterman to Proutytown, which is to be of brick on a concrete base, is being done by the boys.

While sufficient time has not elapsed since the adoption of the program to determine fully its merits, the National Committee on Prisons and Prison Labor has made a favorable report on what has been accomplished.

The Operation of Motor Trucks on Maryland Roads, particularly around Camp Meade and the new proving ground, is said to interfere with the immediate repair of the highways. The collapse of several bridges under the heavy loads carried by the trucks is reported.

The Road from Lewisburg to Ronceverte, Greenbrier County, W. Va., is the first project in the state to be approved for federal aid. The amount of federal funds to be applied to the construction of the highway is $9,246.48, according to report. The distance is approximately 5 mi.

The Wartrace Highway Near Normandy, Tenn., was recently improved by residents of the community. The work included the removal of rocks, the construction of ditches, and of grading and graveling the road. Considerable improvement of this nature has been in progress on the roads entering Normandy, with the result that they are now in excellent condition. Their value has been demonstrated in an advance in the price of land per acre.

GOOD ROADS

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Founded January, 1892

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Old Series, Vol. LII
New Series, Vol. XIV
Number 23

Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

December 8, 1917

WAR-TIME ROAD WORK

It has always been the policy of "Good Roads" to advocate road improvement—not the indiscriminate spending of large sums for road building everywhere, but the economical expenditure of every penny obtainable for the construction and maintenance of the roads that would return a dividend on the investment made.

America's entry into the war that for more than three years has ravaged Europe has not changed that policy. We firmly believe that road building is as much a war measure as it is a necessary activity in time of peace. We go further: We are convinced that there is now even more need of improving our unimproved roads and maintaining our improved roads than there was a year ago—or ten years ago.

For these reasons "Good Roads" has protested against the suggestion that road work be postponed until after the war and has done what it could to counteract the tendency to cut down expenditures for road work. For the same reasons it has regarded as inexpedient and unwise the obstacles to the prosecution of road work erected by embargoes and priority rulings.

As might have been expected, there has been some misunderstanding of the attitude "Good Roads" has taken. Occasionally it has been inferred that "Good Roads" urged a continuation of road building and street paving of all kinds in all places, in other words, continued and increased efforts along the same lines as before the war. Nothing could be further from the intention of this journal, as it is believed a careful reading of what has been printed will show.

The measures "Good Roads" does propose are, first, increased expenditures, greater effort and more efficient and economical prosecution of the work of building those roads most essential to the present needs of the nation, and second, the systematic, continuous maintenance of the roads already built.

The first will add immeasurably to our ability to wage war or build up our industry and commerce in times of peace.

The second will conserve the resources we already possess, prevent the loss of heavy investment made in the past.

Both will help win the war—help to an extent that no one is likely to overestimate.

THE ROAD AROUND STORM KING

A description of one of the most interesting pieces of road work ever noted in "Good Roads" is printed on other pages of this issue. The Storm King Road, during construction, is of interest to engineers and contractors because of the difficulties encountered in the building; when completed, the road will afford the tourist a scenic route of unique attractions and, to commercial traffic, a thoroughfare of great importance.

The article was written especially for "Good Roads" by Deputy Commissioner Breed of the State Commission of Highways, and therefore, is authoritative. The views of the right of way and of the construction work and the cross-sections were also furnished by Mr. Breed from the commission's records. The article has been rather fully illustrated because the pictures and sections convey to the reader the magnitude and character of the work so much more forcefully than does the printed description.

A point that will especially interest engineers and surveyors is the use of the stadia method in the survey. Stadia work has been done by more progressive engineers for a long time, but it is doubtful if highway engineers have employed the method as extensively as its speed and cheapness warrant.

Another noteworthy fact about the undertaking is that practically all of the work done can properly be classed as "permanent" work. Much is written about "permanent" improvements when there is involved work that is really short-lived. No surfacing is permanent—even using the term loosely, as it must be used—though some types of pavement have comparatively long life. But the cutting of a roadway out of the solid rock on a mountainside can be called permanent if anything can.

For such work as the building of the Storm King Road it is good finance to provide funds from 50-year bonds—or even bonds of much longer life.

◆

At An Election Held Recently in Erie County, Pennsylvania, a bond issue of $1,400,000 for highway improvement throughout the county was carried by a substantial majority.

The Building of Coastal Roads in the Philippine Islands has been found practicable, due to the position of the mountain ranges which parallel the coasts, according to a U. S. Commerce report. The excellent highways that have been constructed indicate what probably will be done in the islands, it is stated, which, on account of their mountainous character, however, do not lend themselves readily to road building.

The Second Honor Road Camp in Missouri has been established at Kennett, Dunklin County. The highway project under construction crosses the county from the Arkansas state line through Kennett to the Pemiscot County line. The length of the road is 8 mi. The extension of the road 12 mi. east through Hayti to Caruthersville is under consideration, as at present it is necessary to drive 125 mi. around a swamp in order to reach Hayti from Kennett by wagon or automobile. The proposed new road would reduce the distance to 20 mi., and would permit heavy tonnage to reach shipping points on the Mississippi River.

Estimated Funds Necessary for Highway in Cortland County, New York

The amounts which it is estimated will be required for road work, including grading, bridges, machinery and miscellaneous costs, in the various towns in Cortland County, New York, have been decided upon by the Board of Supervisors. The amounts, to be raised by taxation, are distributed as follows:

Cincinnatus, $2,150; Cortlandville, $5,750; Cuyler, $1,925; Freetown, $2,253; Harford, $1,650; Homer, $6,300; Lapeer, $1,600; Marathon, $3.850; Preble, $1,475; Scott, $2,028; Solon, $1.990; Taylor, $2.800; Truxton, $2,570; Virgil, $4,800; Willet, $2,200.

Concrete Highway Planned for Winnebago County, Wisconsin

A concrete highway is to be constructed from Oshkosh, Winnebago County, to the Fond du Lac County line next year, according to a recent report from that state. The distance is 4.5 mi. It is proposed to improve this mileage at a cost of $75,000, the county to pay one-third. The balance will be derived from federal and state aid.

A similar plan applies to the extension of the road in Fond du Lac County between the Winnebago County line and Friendship, which will provide a concrete highway between Oshkosh and Fond du Lac, Friendship being the present terminus of the improvement. This highway is an important part of the state trunk line system. Its construction will not suspend county highway work.

Highway Funds to Be Raised in Steuben County, New York

The Board of Supervisors of Steuben County, New York, have proportioned the highway tax to be levied by the towns in the county during 1918. The amounts to be raised by the respective towns are as follows, according to report:

Addison, $2,317; Avoca, $4,700; Bath, $5,669; Bradford, $1,250; Cameron, $4,615; Campbell, $2,950; Canisteo, $5,250; Caton, $3,538; Cohocton, $8,550; Corning, $4,650; Dansville, $8,050; Erwin, $4,500; Fremont, $3,757; Greenwood, $5,267; Hartsville, $1.875; Hornby, $2,200; Hornellsville, $5,500; Howard, $5,034; Jasper, $4,512; Lindley, $2,700; Prattsburg, $4,750; Pulteney, $4,985; Rathbone, $3,600; Thurston, $2,950; Troupsburg, $3,295; Tuscarora, $2,573; Urbana, $5,400; Wayland, $5,200; Wayne, $1,962; West Union, $1,300; Wheeler, $3.500; Woodhull, $4,973. The total tax amounts to approximately $132,000.

Formal Opening of the Toronto-Hamilton Highway

The official opening of the Toronto-Hamilton Highway in Ontario took place on Saturday, Nov. 24, the scene of the opening being the end of the road adjacent to Toronto. The ceremony was participated in by Sir John Hendrie, Lieutenant-Governor of Ontario, Sir William Hearst, Prime Minister of the Province, and the Honorable F. G. Macdiarmid, Minister of Public Works and Highways.

The opening ceremony was followed by a drive over the road to Hamilton, a distance of 36 mi., where luncheon was served at the Royal Connaught Hotel. Following the luncheon, addresses were made by Geo. H. Gooderham, Chairman of the Toronto-Hamilton Highway Commission; Sir William Hearst, and Edwin Duffey, State Commissioner of Highways of New York.

This highway, which connects Toronto with Hamilton, will be the most heavily traveled section of the proposed provincial highway system, which is expected to comprise the main route from Windsor, Ont., opposite Detroit, Mich., easterly in a direct line through Hamilton and Toronto to Ottawa, with a branch to continue along the St. Lawrence River to Montreal. A branch will also extend from Hamilton to Niagara Falls. This road is at present in fair condition, providing a good connection from Toronto to the New York state highway system.

National Forest Road Building to Continue

Of the National Forest roads that are to receive the benefit of federal aid, two are now under construction in California. One of these projects is known as the Salmon River Road, and is located in the Klamath National Forest. A portion of this road has been constructed through hard rock. The other road is in the Trinity National Forest, paralleling the south fork of the Trinity River.

The Salmon River Road will provide a direct route between points in northern California. Its construction will cost $150,000. The Trinity River Road will also serve an isolated region. The improvement of these routes will not be delayed on account of the war, according to report.

Snow Plows for Clearing the Highways in Pennsylvania

It was announced recently by the Pennsylvania State Highway Department that preparations were under way for keeping the highways of the state open for traffic during the winter months. This was deemed vitally essential on account of the increased use of the thoroughfares by motor truck trains carrying supplies across the country from Ohio and other middle states.

For the removal of snow from routes in the Allegheny and Blue Ridge Mountains it is proposed to equip eight motor trucks with snow plows and place them along the line of the roads in the higher altitudes for emergency work.

Extensive Street Improvements Made in Bristol, Connecticut

The street improvements that have been in progress for several months in Bristol, Conn., and are practically completed, have benefited a large section of the city and have cost $105,000.

The work included the laying of sidewalks and curbs on every street in the first taxing district, which was also graded. Gravel macadam surfacing was used on a number of streets.

D. Frank Crowley, of Bristol, was the contractor for the Hill section of the city; D'Onfro Brothers, of Bristol, for the South Side, and John McGuire, of New Britain, did the work on the North Side.

Preparing for Road Improvement in Jefferson County, Alabama

The Board of Revenue of Jefferson County, Alabama, of which J. W. Gwin is chairman, will call an election in February for the approval of a proposed bond issue of $4,000,000 for the construction of 300 mi. of highway in the county. If it is decided to issue the bonds a committee of citizens, it is stated, will be designated to select the material.

The law prohibiting the collection of road taxes in counties having a greater population than 200,000 was recently upheld in Jefferson County. This annuls the old system of road "working," which required each resident to either furnish his personal labor or pay an established tax in lieu thereof. The decision was handed down by the supreme court of the state.

MEETINGS

Calendar of Coming Meetings

Jan. 12, 1918.—Northwestern Society of Highway Engineers.—Annual meeting, Benson Hotel, Portland, Ore. Secretary, C. G. Reiter, Hillsboro, Ore.

Jan. 15-17, 1918.—Virginia Good Roads Association.—Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

Jan. 22-24, 1918.—American Wood Preservers' Association—Annual meeting, Chicago, Ill. Secretary F. J. Angier, Baltimore & Ohio Railroad, Mount Royal Station, Baltimore, Md.

Feb. 7-9, 1918.—American Concrete Institute.—Annual convention, La Salle Hotel, Chicago, Ill. Secretary H. B. Alvord, 27 School St., Boston, Mass.

Feb. 8-9, 1918.—American Concrete Pipe Association.—Annual convention. Sherman Hotel, Chicago, Ill. Secretary, J. H. Libberton, 208 S. La Salle St., Chicago, Ill.

American Road Builders' Association

The holding of a convention at St. Louis, Mo., early in February of next year was decided upon at a meeting of the board of directors of the American Road Builders' Association, held at the association's headquarters in New York City on Monday of this week.

The meeting will be the fifteenth annual convention of the organization. An exhibit in the ballroom of the hotel where the convention is held will take the place this year of the road show that has been held in previous years. This, it is understood, is only a temporary arrangement, and it is expected that after the war the exhibition of machinery and materials will again become a regular feature of the annual convention. The decision to furnish manufacturers and dealers facilities for showing photographs, models, literature and other exhibits of the kind was due, it is announced, to existing conditions. It was felt that in deference to the wishes of the Government everything possible ought to be done to avoid unnecessary shipments.

Northwestern Ohio Surveyors' Association

At a recent meeting of the Northwestern Ohio Surveyors' Association in Findlay, Ohio, the classification of road building as a war necessity was urged, with especial reference to a modification of the Government's priority order concerning the use of open top cars for hauling material.

Cecil Rood, County Surveyor of Lucas County, was elected president of the association for the ensuing year.

County Commissioners of Georgia

In an address before the annual meeting of the County Commissioners of Georgia, held at Savannah, November 21, Judge T. E. Patterson, Chairman of the State Highway Commission, stated that plans were being made to start the actual work of construction on the four highway projects, which will be the first to receive federal aid, by the first of next year. The amount of federal aid alloted to these roads is $134,000.

The levying of a special state tax for the purpose of state aid road construction was recommended by the commissioners, and a committee, cooperating with the Georgia State Highway Commission, will prepare a bill to be presented to the Legislature. It was suggested that a levy of one-half of one per cent. would probably meet the requirements, although the rate of taxation was not decided upon.

Officers for 1918 were elected as follows: President, Harvey Grainger, Savannah; First Vice President, Oscar Mills, Atlanta; Second Vice President, M. Rilander, Americus; Third Vice President, W. A. Pringle, Thomasville; Secretary, Fred Houser, Atlanta.

The commissioners will meet in Savannah next year.

General Contractors' Association

The annual meeting of the General Contractors' Association, whose headquarters are at 5 Chambers St., New York, N. Y., takes place in New York City today. C. A. Crane is secretary of the organization.

Automobile Club of Buffalo, New York

The Board of Directors of the Automobile Club of Buffalo, N. Y., met recently and adopted a resolution emphasizing the necessity of road building as a war measure, and urging that priority be given to the shipment of road building materials without delay.

American Association of State Highway Officials

The members of the American Association of State Highway Officials met in annual convention at the Hotel Jefferson, Richmond, Va., on Tuesday, Wednesday and Thursday of this week. The program of this meeting, of which a large portion was devoted to questions resulting from the war, was given in detail in the issue of Nov. 24.

Alabama Good Roads Association

The twenty-first annual session of the Alabama Good Roads Association was held in Birmingham, Nov. 27, in the Hillman Hotel.

The meeting, which was thoroughly a business one, was called to order by John O'Neill, President of the Jefferson County Good Roads Association, who extended a welcome to the delegates and visitors on behalf of that association. John R. Hornady, of the City Commission, made the official welcome for the city.

John Craft, President of the Alabama Good Roads Association, was introduced and took charge of the meeting by responding to the welcome accorded the members and delegates. He also outlined a plan for future work in promoting highway improvement in the state.

A resume of the work of the association during the preceding twelve months was presented by Secretary J. A. Rountree in his annual report. W. F. Fitts, of Tuscaloosa, opened the general discussion on road building, which occupied the entire afternoon. Several speeches were made at the evening session.

The convention went on record as favoring the withdrawing of convicts from private contract and placing them on the public roads; the exclusive use of revenue from motor vehicle licenses in the construction and maintenance of roads and streets, and the supervision of road work in counties by competent highway engineers. The convention also emphasized the necessity for highway improvement at this time, urging that road building material be given a priority classification by federal authorities.

(*Continued on page 303*)

New York State Road Builders' Association

OFFICERS

JOHN H. GORDON, President
Albany, N. Y.

C. J. HENDRICKSON, Vice President
Syracuse, N. Y.

WILLIAM G. FOX, Treasurer
Saratoga, N. Y.

JOSEPH W. MANION, Secretary
Albany, N. Y.

TRUSTEES

JOHN B. JOHNSON	Buffalo, N. Y.
W. A. GREENFIELD	Hornell, N. Y.
T. H. GILL	Boston, Mass.
FRED E. ELLIS	Melrose, Mass.
W. T. THAYER	Chateaugay, N. Y.
A. J. ROCKWOOD	Rochester, N. Y.
JOSEPH WALKER	Albany, N. Y.
S. B. VAN WAGENEN	Rondout, N. Y.

LEGISLATIVE COMMITTEE

FRANK G. FOWLER, Chairman,	Mt. Kisco, N. Y.
JOHN B. DOWER	Ballston Spa, N. Y.
H. B. HARRISON	Buffalo, N. Y.
JOS. McCORMICK	E. Providence, R. I.
W. R. SMITH	Meriden, Conn.
C. W. TRYON	Poland, N. Y.
N. E. YOUNG	Binghamton, N. Y.

MEMBERSHIP COMMITTEE

RICHARD HOPKINS, Chairman,	Troy, N. Y.
GEORGE CHAMBERS	Rochester, N. Y.
FRED E. ELLIS	Melrose, Mass.
GEORGE H. GIFFORD	Jamaica, L. I.
W. A. GREENFIELD	Hornell, N. Y.
C. J. HENDRICKSON	Syracuse, N. Y.
J. F. PADDELFORD	Sherburne, N. Y.
H. B. SPROUL	Peekskill, N. Y.

Crusher Run

The completion of State Highway 5,510, extending from Bloomingburg to Monticello, which was opened to traffic in November, provides a continuous improved route from these points to Westfield in Chautauqua County, on the route leading from Buffalo to Cleveland, O.

Owing to freezing weather, Contractor Harradine has stopped the work of laying concrete on Route 30 for this season. Repairs have been made to a particularly bad portion of the highway in Wallingford, which will serve the convenience of a large number of travelers who have been obliged to use another road.

It has been suggested that the most practicable method of utilizing the work of interned Germans on the highways of this country in connection with the Chamberlain-Dent bill, a military highway measure now awaiting congressional action, would be provided by authority given to the War Department to direct the work through the Engineer Corps.

A proposed highway measure prepared by Assemblyman Machold provides that towns be divided into highway districts and that the expense of taking care of the indigent population be assessed against the particular district in which it exists. It is given as the opinion of some of the supervisors that certain districts would probably not have sufficient funds to meet the assessments.

The buying of road building materials by the California State Highway Commission results in a saving of labor in this detail of highway work, according to report. The material is furnished by the commission to the contractors. The equipment used to handle the material from the railway cars to points of delivery, which includes a large number of motor trucks, is not regarded as expensive when properly operated.

Road activity in Monroe County next year will probably be limited to the work of repair if conditions that now obtain in regard to material and labor should continue during the year. The same is true of adjoining counties. For the reason, however, that the counties referred to constitute the seventh highway district of the state, the work of repairing the roads therein represents an undertaking of considerable volume.

The work of repairing the Canandaigua-Geneva Road, which for some time has required a detour to be made by way of Seneca Castle in going from Rochester to points east of that city, has been completed and the highway was thrown open to the public last month. The alternate route between Rochester and Syracuse, which runs by way of Manchester, Clifton Springs and Phelps, has also been put in good condition by an oil treatment.

The State Commissioner of Highways recently held a hearing on the subject of the acquisition by the state of the bridges which span the Hudson River in the city of Troy. There is a very prevalent belief that all of these structures on which a toll is now charged should be freed. It is probable that as soon as a reasonable agreement can be reached between the state and the private corporations owning the bridges they will become a part of the free public highways.

Widespread interest is felt in the tire testing experiments made by the B. F. Goodrich Rubber Co., of Akron, Ohio, during a period of nine months, in which approximately 5,000,000 mi. of highway in the United States were covered by fleets sent out under special crews. Those in charge of the fleets report that due to the extension of highway improvement everywhere, there is practically no part of the country now inaccessible to the automobile, not excepting the desert portions of the West, which the tire testing fleets traversed.

A statement prepared by the State Commission of Highways, which was recently filed with the Board of Supervisors of Niagara County, designates the amounts that are to be furnished for state and county highway maintenance during 1918 by the various towns in the county. The amounts to be raised by each town by taxation, totaling $5,800, are as follows:

Cambria, $850; Hartland, $650; Lewiston, $950; Lockport, $500; Newfane, $700; Niagara, $150; Pendleton, $100; Porter, $50; Royalton, $950; Somerset, $150; Wheatland, $750.

The mileage of roads to be maintained is 115.05.

MHA

Massachusetts Highway Association

Founded 1893

OFFICERS FOR 1916-17

President, JOHN A. WILLIAMS, of Framingham

Secretary
JOHN M. McCARTHY
15 Ashburton Place
Boston

Treasurer
CHARLES A. BROWN
Wellesley

Vice-Presidents
JOHN M. KEYES, Concord
WILLIAM J. GANNON, Fitchburg

Directors
CHARLES J. BENNETT, Hartford, Conn.
RICHARD A. JONES, Waltham
HENRY A. SPATES, Winchester
JOHN A. GAFFEY, Medford

Announcement

This section of the paper is open to members of the Massachusetts Highway Association for the discussion of matters directly connected with road interests. Members are requested to submit items of interest for use in this column.

Address all communicaions to GOOD ROADS, P. O. Box 2613, Boston.

At a meeting of the Board of Directors of the M. H. A. it was voted to hold an evening meeting of the association at seven o'clock on Dec. 13 at Kingsley Hall in the Ford Building on Ashburton Place, Boston.

The speaker for the evening has not been selected and the matter is in the hands of a committee.

Members present at the directors' meeting: Messrs. Gaffey, Gannon, Spates and McCarthy.

News and Gossip

There has been much favorable comment in the Boston daily papers regarding the recent marked improvement in the roads in Woburn which has been accomplished under the supervision of Commissioner of Public Works Macksey.

The place has been practically transformed in the reconstruction of its streets, walks and open spaces, not only in the center but in all directions leading out of the city. The most noticeable change outside of the remarkable general improvement in street surfaces is the reconstructing of the square. This has been only a piece of land, with rough gravel walks, surrounded by worn and muddy street surfaces. All this has been changed and a municipal center of modern type has been developed.

Permanent highway construction recently completed affords smooth going on Montvale Avenue toward Stoneham, Pleasant Street and Lexington Street to the Lexington Line, and Main Street to Winchester.

The noteworthy fact in connection with these expensive improvements is that the tax rate has been reduced from $22.30 last year to $21.20 this year, and during the same period the next municipal debt has been reduced by $10,000. For all of this excellent and efficient work Mr. Macksey deserves due credit.

After seven years of a commission form of government Lynn has voted to return to a mayor and board of aldermen. The vote was 6,013 for the amendment and 3,731 to retain the present form of government.

The new charter goes into effect on Jan. 1, 1918, and provides for a mayor and eleven aldermen, four at large and seven by wards.

At the recent caucus in Lowell, Street Commissioner Charles F. Morse headed the list of nominees with 4,045 votes. Some of the other candidates were: James E. Donnelly, 3,604; James F. Muskella, 2,965; Newall F. Putnam, 2,930; and Daniel Cosgrove, 2,380.

Mayor James E. O'Donnell was defeated for renomination.

Methuen has decided to become a city, by a vote of 912 to 450. This brings the total cities in Massachusetts to 38. There are now remaining 16 towns in the state having the requisite 12,000 population necessary to admit them as cities.

Town officials who anticipate using asphalt or tar materials for road construction or maintenance during next year would do well to make inquiries now as to the available supply and prices so that highway appropriations can be increased to meet the considerable advance in price that is predicted for all bituminous road materials.

The citizens of Waltham voted on Nov. 6 to change their form of town government and adopt Plan D, which provides for a council and a town manager.

Winchester, after long consideration of a change of town government, rejected the plan for a town manager at the recent election by a vote of 956 to 497.

On Nov. 12, the Hugh Nawn Construction Co., under orders from the War Department, started work on the widening of Washington St. in Quincy from City Square to Quincy Point, a distance of 2 mi.

This construction was found necessary in order to increase transportation facilities in the vicinity of the Fore River ship building plant. Eighteen buildings will have to be removed, hundreds of trees will be cut down and most of the dwellings now standing back from the sidewalk lines will be left flush with the street line.

In addition to the widening of the roadway, a double track car line will be constructed. The cost of the work is estimated at $350,000.

Selectman William H. Sherrill of Richmond, Mass., was elected on Nov. 8 a member of the Board of County Commissioners of Berkshire County. A factor that greatly helped Mr. Sherrill was that, as chairman of the Board of Selectmen of Richmond, he built the best system of town roads to be found in the Berkshire section. Commissioner Sherrill has served as a selectman of Richmond continuously for 32 years.

William J. Gannon, Vice President, M. H. A., is now Acting Commissioner of Streets and Engineering of Fitchburg and will hold this position until the citizens have voted on the matter of consolidating the various city departments under a board of public works.

Members of the M. H. A. will be interested to know that John J. McCarthy, Jr., son of Secretary McCarthy, immediately upon his graduation from Tufts College, enlisted in U. S. Field Artillery and he is now serving as a corporal with his battery at the army training camp at Minneapolis.

In Lowell the recent government restrictions have cut off the rail delivery of crushed stone and for some time road material has been hauled by motor trucks from the crushing plant in Winchester.

Road work in the City of Springfield was interfered with by the government orders prohibiting the use of open top freight cars for crushed stone, but the emergency has been partially met through Superintendent Clark's action in obtaining some cinder cars for use in hauling stone from the Lane Quarries in Westfield to his storage bins.

The U. S. Government, through the secretary of agriculture, has made a total appropriation of $14,550,000 out of federal road funds to be expended during the fiscal year ending June 30, 1919.

The New England states will receive the following allotments: Massachusetts, $220,261.85; Connecticut, $92,216.45; New Hampshire, $62,610.11; Maine, $144,807.42; Rhode Island, $34,972.38; Vermont, $68,128.92. This is the third distribution of federal aid funds.

Maj. Christopher Harrison, formerly City Engineer of Everett, Mass., and for a long time a member of the M. H. A., resigned from his position in Everett on April 1, and is now pleasantly located as Town Engineer of Montclair, N. J.

W. C. H. Stevenson, who recently resigned as Superintendent of Streets of Reading, is now employed as Superintendent of Streets of Attleboro, Mass., under Commissioner of Public Works Goodale.

The many friends of Mr. Joseph Conley, Superintendent of Public Works of the town of Norwood, will be pleased to learn that he has recovered from his recent illness and has returned to work.

In Concord, Mass., Road Commissioner John M. Keyes is gradually completing a fine system of bituminous macadam roads. About 8 mi. of new penetration surface has already been finished by the following method: Worn-out material is removed from the old road to a proper depth, then 6 in. of cobble or field stones are laid with a generous covering of gravel for a binder, thoroughly rolled. On this is placed a course of from 3 to 4 in. of crushed stone which is shaped and given two penetration applications of bituminous materials, the first application being 1½ gal. per sq. yd. with a seal coat of ½ gal. This type of roadway costs approximately $1.50 per sq. yd., which includes an allowance for overhead charges.

There has been a long and heated argument between the army officials of Camp Devens and the town fathers of Ayer over the 3 mi. of highway between the village and the cantonment.

The condition of this section for some time past could hardly have been worse, and the town authorities took the ground that there was no town money available for road work and that none could be secured until the appropriations were made for 1918.

It was finally decided that the town could not be compelled to do the necessary work, so the U. S. Government, the State of Massachusetts and the county are to share the expense, which will be something over $30,000.

The tax rate in Holyoke is up 40 ct., to $18.80 divided as follows:

	1917	1916
State	$2.00	$1.44
County	.71	.60
City	16.09	16.36
	$18.80	$18.40

The town of Concord, Mass., was 282 years old on Sept. 12. It was incorporated in 1635, 15 years after the landing of the Pilgrims. Besides being a place of many historical movements, it is also well known as the home of the Hon. John M. Keyes.

Major Perlie A. Dyar had an exciting experience the other night when a fire started in the basement of the apartment house where he lives. The damage was not great, but the dense clouds of smoke drove the occupants out of doors in scant attire. We hope the Major didn't catch cold.

The Mayoralty race in Cambridge is being warmly contested and from all accounts former Superintendent of Streets Edward A. Quinn stands a good chance for election. He is the only Democrat running and there are several Republican candidates. We hope "Eddie" will be elected.

Lynnfield's tax rate is $18.70, an increase of $2. Larger local appropriations, with highway improvements a factor, and higher state and county taxes are responsible for the higher rate.

Francis G. Williams of 37 Albion Street, Somerville, a Civil War veteran, died at his home on Nov. 27, after a long illness. Mr. Williams was born in Putnam, Conn., on July 9, 1833, but had made his home in Somerville since his return from the Civil War. As a young man he enlisted in Company B, 5th Regiment, serving throughout the war. He afterward was engaged in the milk business for a short time and then became superintendent of streets, a position which he held for 18 years. He is survived by three daughters, Frances Williams and Margaret R. Williams, who live in Somerville, and Mrs. Florence Brookhouse of Hartford, Conn.

Patrick McGovern & Co., contractors, have appealed to the full bench of the Supreme Court from a decree of Judge Carroll of the Supreme Court sustaining a demurrer of the City of Boston to the firm's suit against it to recover $200,000 additional pay for constructing the section of Dorchester tunnel under the Fort Point Channel. The ground of the suit is that the plans of the Transit Commission failed to disclose a ledge of rock under Fort Point Channel that caused a $200,000 loss to the contracting firm. Judge Carroll ruled that the firm was bound by the contract.

The tax rate for Newton this year will be $19.80 instead of $20, as was incorrectly stated in the Boston "Traveler." This is an increase of 90 ct. from last year's rate of $18.90. The state tax this year amounts to $399,160.66, against $343,095.39 last year.

The Finance Committee of Medford has under consideration an appropriation of $200 proposed to be expended in bringing up to date the record maps and plans of the city departments. This work has not been systematically done for ten years.

Mayor Childs of Newton has been accorded an unusual honor inasmuch as he will be unopposed in the coming election for his third term as mayor. This is the first time in the city's history that such a thing has happened.

Commissioner James W. Synan has been delegated by the Highway Board to have charge of the Automobile Division. If you have a machine that will be in running order after Jan. 1, you are requested to step up to the counter and pass Mr. Synan the necessary cash or check for your license as promptly as possible, for the commission expects to strictly enforce the regulations governing number plates next year and no leeway will be allowed or excuses accepted from those who appear after New Year's Day without 1918 numbers.

Richard Jones, Superintendent of Streets of Waltham, left Boston on Nov. 24 for his annual vacation in Florida. Mr. Jones is interested in land development near Lake Worth and there is a possibility that he may locate there permanently unless his health improves. He has been feeling badly for some time and his doctor has advised him to try the warmer climate. He was accompanied by his son, Fred Jones, and Lyman Morrill.

Roll of Honor of the Massachusetts Highway Commission

Name.	Rank.	Service.
Atkins, A. R	Private	23d Engineer Corps
Atkinson, F. R	Private	23d Engineer Corps
Barkan, J. R	Second-class Yeoman	Portland, Me.
Batchelder, M. J	Private	U. S. Marine Corps
Bean, W. W	Sergeant	103d Regiment, Infantry
Burns, W. G	Captain	U. S. Reserve Engineer Corps
Cannon, Martin A	Seaman	U. S. S. Nebraska
Carolan, A. J	Corporal	Camp Quartermaster, Camp Devens
Connolly, L. F	Cadet	Naval Academy, Annapolis
Cook, W. M	Private	23d Engineer Corps
Cushman, R. J	Private	Co. A, 301st Engineer Corps
Davis, R. A	Corporal	Co. A, 503d Service Battalion
Dolan, Wm. A., Jr	Private	Aero Corps, U. S. Army
Dooling, George S	Private	Co. K, 328th Infantry
Downing, D. F	Private	23d Engineer Corps
Foote, Alfred F	Major	104th Regiment, U. S. Infantry
Hanf, F. S	Second Lieutenant	U. S. Reserves
Hanna, Elmer K	Seaman	U. S. S. Nebraska
Harvie, E. W	Private	101st Engineer Corps
Hodgson, J. A	Private	23d Engineer Corps
Hosford, R. N	Private	121st Aero Squadron
Jenkins, R. E	Private	23d Engineer Corps
Kelley, H. C	Yeoman	U. S. N. Reserves, Annapolis
Ladd, P. H	Private	101st Ammunition Train
Lewenberg, Maurice	Private	Quartermaster's Depot, Ayer
Long, A. W	Ensign	U. S. Transport Pensacola
Lynch, Maurice A	Private	23d Engineer Corps
Marnell, H. F	Private	101st Engineer Corps
Mattson, W. K	First Lieutenant	101st Engineer Corps
Maylis, M. E	First-class Yeoman	U. S. Navy
Merrill, D. H	Hydroplane Operator	Aviation Section, U. S. Navy
Morrill, C. H	Master Engineer	23d Engineer Corps
Morss, C. H	Captain	Battery A, 103d Field Artillery
Norris, R. H	Hydroplane Operator	Aviation Section, U. S. Navy
Palmer, Osbern	First Lieutenant	Co. B, 101st Engineer Corps
Polak, H. J	Second-class Yeoman	U. S. Naval Reserves
Prescott, Charles F	Private	301st Infantry
Putnam, H. W	Private	Camp Devens, Ayer
Raymond, Cyril B	Private	23d Engineer Corps
Rubin, J. A	First-class Yeoman	U. S. Navy
Somers, B. X	First-class Seaman	U. S. Naval Reserve
Souter, G. S	Private	Camp Devens, Ayer
Springer, Isaac	Private	U. S. Aero Corps, M. I. T., Cambridge
Sterl, C. W	Sergeant	Co. F, 23d Engineer Corps
Thomas, M. S	Sergeant	101st French Mortar Battery
Vose, A. W	Private	14th Co., 4th Battalion, Depot Brigade

Meetings

(*Continued from page 299*)

Officers were elected for the ensuing year as follows: President, John Craft, Mobile; Vice President, John W. O'Neill, Birmingham; Second Vice President, J. E. Pierce, Huntsville; Third Vice President, Senator John H. Bankhead, Jasper; Fourth Vice President, Frank S. White, Birmingham; Secretary, J. A. Rountree, Birmingham; Treasurer, J. B. Elliott, Birmingham. Executive Committee: Hugh McGeever, Birmingham; Governor Charles Henderson, Montgomery; L. F. Scarborough, Anniston; J. F. Kelton, Oneonta; B. H. Cooper, Birmingham; E. B. Almon, Tuscumbia; J. W. Shepherd, Jasper; Marvin Pierce, Piercesville; H. A. Elkourie, Birmingham; W. L. Waters, Alexander City.

PERSONAL NOTES

E. L. Gostin has succeeded J. J. Gaillard as City Engineer of Macon, Ga.

George S. Pierson has been appointed Highway Engineer of Kalamazoo county, Michigan.

Warren R. Neel has been appointed Chief Engineer of the Georgia State Highway Department.

R. W. Gearhart has been appointed County Engineer of Linn County, Iowa, having resigned as County Engineer of Buchanan County.

(*Continued on page 304*)

New Hampshire Good Roads Association

OFFICERS FOR 1916-17
ALFRED CLARK, President
Concord, N. H.

First Vice President
F. E. Everett, Concord, N. H.
Second Vice President
Chas. H. French, Laconia, N. H.
Secretary and Treasurer,
George P. Winn, Nashua, N. H.

Board of Directors,
O. F. Winslow, Nashua, N. H.
C. M. Brooks, Keene, N. H.
H. L. Smith, Lakeport, N. H.
E. H. Wason, Nashua, N. H.
A. A. Wallace, Keene, N. H.

A very tragic accident occurred recently at Nashua in which the wife of Frank T. Lewis of the Board of Public Works lost her life.

Mrs. Lewis was riding in a buggy driven by her sister, Mrs. Clara Smith, and as they approached the Crown Street crossing the gates were up and some men working on the track said that they could pass safely and that the gates were out of order. As they attempted to cross, the buggy was struck by the 5:07 train from Boston and both ladies were thrown out and killed. The horse was also killed and the buggy completely demolished.

The new state road between Wilton,, New Hampshire and the Lindeboro line, which is being built by the state under the direction of the selectmen and Engineer Victor Tuttle, has been completed and accepted.

The Committee of the N. H. Good Roads Association having in charge the selection of the place for the December meeting has not yet reached a decision.

The town of Amherst is preparing to construct several small concrete bridges, the work to be started early next year if labor and materials can be obtained.

A. E. White, Superintendent of State Highway Maintenance on the trunk line between Manchester and Nashua, has been drafted.

For the first time in more than a generation the political control of the City of Manchester will pass to the Democratic party. The present Mayor, Harry W. Spaulding, was not only defeated by Moise Verette by 1,418 votes, but practically all city offices were lost to the party now in control.

At the recent election, ex-Mayor Charles J. French, of Concord, defeated Mayor Nathan W. Hobbs by 1,783 votes to 1,695. For seven years Mr. French was Mayor of Concord, having been successful in four elections. The three members of the present Board of Public Works, Messrs. Brown, Sturtevant and Lee, were all reelected.

The citizens of New Hampshire should be pleased to learn of the dedication of a thousand-acre reservation on the summit of Mount Kearsarge as a memorial to the late Governor Frank West Rollins, in appreciation of his untiring and successful efforts during fifteen years to preserve the scenic beauty of the state and promote the efforts of the New Hampshire Forestry Commission to protect the forests. The name of Mount Kearsarge recalls the historic naval battle fought during the Civil War between the Union corvette "Kearsarge" and the Confederate raider "Alabama." The name of the mountain was given to the ship at the suggestion of S. H. Gilmore, son of the war governor, who was requested by the Secretary of the Navy to submit a list of Indian names to be given to the fleet of war ships then building, and it is of further interest that the oak timbers used in the hull of this vessel came from the slopes of the mountain whose name she bore. About 1865 a hotel was built on the northern slopes of Kearsage Mountain and about 1879 Hon. William E. Chandler was instrumental in having a railroad extended to the town of Warner, with the hope of bringing the public to the mountain, and a charter was obtained to build a toll road to the summit. The road cost about $5,000, but it was not a financial success and the project for a hotel at the end of the road was abandoned. On account of commanding heights a permanent watch tower will be maintained on the mountain by the Forestry Commission in connection with forest fire prevention.

Personal Notes

(Continued from page 303)

Lewis B. Sebring has been made City Engineer of Schenectady, N. Y., succeeding W. Thomas Wooley.

Frank R. Stone, a highway contractor of Lima, Ohio, has received a commission as first lieutenant in the 23d Engineers, Camp Meade, Md.

James G. Cooney, formerly an engineer of the Illinois State Highway Commission, is now in the valuation department of the Interstate Commerce Commission at Chicago.

Chalmers Miller, Assistant City Engineer, will succeed C. M. Osborne as City Engineer of Lorain, Ohio.

C. M. Osborne has resigned the office of City Engineer of Lorain, Ohio, to become City Manager of East Cleveland, Ohio, effective Jan. 1.

George D. Fairtrace has been appointed City Engineer of Dallas, Texas, to succeed Hal Moseley, who has occupied the position for about two years.

Andrew Holloway, a prominent highway contractor of Pasadena, Cal., died recently at his home in that city. Mr. Holloway was a native of England, but had resided in southern California since 1889.

GOOD ROADS

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WITH WHICH IS INCORPORATED

THE HIGHWAY CONTRACTOR AND ROAD BUILDER

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NEW YORK, DECEMBER 15, 1917

Number 24

The Toronto and Hamilton Highway*

BY GEORGE H. GOODERHAM†

In the Public Archives of Canada, Series Q, Vol. 283, 1798, we read it is ordered "that roads be opened, with bridges between the Humber and the Credit and from the Credit to the head of the lake, the work to be done by the Queen's Rangers." By this action the Toronto and Hamilton Highway originated. The diary of the Provincial Land Surveyor, Mr. Augustus Jones, for May 19, 1798, contains this entry: "Saturday, 19th May, '98—Busy marking the most eligible ground for a road from the mouth of the Humber to a creek called Lamabinecouce, struck it above the pond and marsh—fine weather." If we follow in detail the record made by Mr. Jones it is evident that even at that early date the construction of this highway presented many difficulties, especially the portion included within the County of York. No one can sympathize with these early road builders more fully or more knowingly than the members of the present commission. There are those who say, with the firm conviction born of a trip between the two cities on a rainy day, that for the 116 years following 1798 no attempt was made to improve upon the work of the Queen's Rangers.

That these conditions do not exist today is due primarily to the efforts of Mr. W. D. Flatt to whom the blazing of a trail has ever been a work of love.

The almost impassable condition of the Lake Shore Road in the spring of 1912 led him to head a deputation which waited upon the Council of the Township of Nelson and urged the necessity of a macadam highway. The reeve, Mr. J. P. Griffin, in replying to the deputation, stated that he thought a macadam roadway would be of little value on account of the traffic that it would be called upon to bear. He believed that a more permanent form of construction was desirable. He knew that Mr. W. A. McLean, then Engineer of Highways, had already given this matter his earnest consideration, and he believed that a deputation should wait upon the Government. With the backing of the Nelson Township Council, Mr. Flatt took up this matter with the reeves of the various municipalities through which the highway would pass. Maj. T. Kennedy, Chairman of the Ontario Good Roads Association, was also consulted, and a meeting called at which Maj. Kennedy was elected chairman and Mr. Flatt, honorary secretary. A committee consisting of Maj. Kennedy, Chairman, Good Roads Association; Reeve Forster, of Oakville; Reeve Griffin, of Nelson; Reeve Lush, of Toronto Township; Reeve Ford, of Trafalgar; Reeve Attridge, of East Flamboro; Reeve Smith, of

THE TORONTO-HAMILTON HIGHWAY.

Typical Views on the 36-mi. Concrete Paved Road Between Toronto and Hamilton, Ontario.

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*Paper presented at the official opening of the road, Nov. 24, 1917.

†Chairman, Toronto and Hamilton Highway Commission.

Burlington; Reeve Beck, of Etobicoke; Reeve Vance, of Waterdown; Reeve Gardhouse, of York; Mayor Lees, of Hamilton; Mayor Hocken, of Toronto, and W. D. Flatt, Honorary Secretary, was appointed at a meeting held in Oakville in December, 1912, Geo. Ironsides, Reeve of New Toronto, and R. H. Skelton, of Mimico, being added later. It waited upon the Government and was advised to return with a more definite plan. A general meeting of representatives from all the municipalities, including Toronto and Hamilton, was held in Oakville. Wardens Beck, Gardhouse and Griffin were requested to draw up a resolution as to the route which should be followed. Their resolution favored the Lake Shore Road and was unanimously endorsed by the meeting. Petitions pledging a frontage tax were signed by almost all of the abutting property owners. The municipalities pledged a general tax and the cities of Toronto and Hamilton contributions, resolutions being passed by every townshipped county council between Toronto and Hamilton and by the councils of the two cities.

In February, 1913, a large delegation representing the Toronto Board of Control and Council; Toronto Board of Trade; Toronto Manufacturers' Association; Ontario Motor League; Hamilton Board of Control and Council; Hamilton Board of Trade; Hamilton Manufacturers' Association; Wentworth County Council; Halton County Council; Peel County Council; York County Council; York Highway Commission; East Flamboro Township Council; Nelson Township Council; Trafalgar Township Council; Toronto Township Council; Etobicoke Township Council; Burlington Council; Oakville Council; Mayor and Board of Oakville; New Toronto Council, and Mimico Council waited upon the Government. They were received by the Honorable Minister of Public Works; Hon. Dr. Reaume; the Hon. Mr. Hanna and the Hon. Mr. Duff. The speakers were Comptroller McCarthy, of Toronto; Mayor Allan, of Hamilton; J. P. Griffin, of Nelson, and M. C. Smith, Reeve of Burlington. The Hon. Dr. Reaume replied for the Government, giving the assurance that the matter would be taken up seriously.

Later a smaller deputation again waited upon the Government and was informed that legislation would be passed at the following session by which such a permanent highway could be constructed.

By these efforts a strong sentiment had been created but it was not crystallized into action until the fateful August of 1914 arrived.

The entrance of the Empire into the Great War paralyzed Canadian industry. Thousands of men were thrown out of employment. Thinking citizens looked forward to the coming winter with horror. A little group, consisting of Lieut.-Col. John A. Cooper, who is now overseas, Mr. G. Frank Beer, Mr. Mark H. Irish and the speaker, was wondering one night how the situation could best be met. Soup kitchens did not seem to be the proper solution to offer men who were clamoring for honorable employment. The highway was mentioned and although none of us had any knowledge of road construction, all realized that such a work would employ labor in its construction and keep quarries and manufacturing plants busy. On the impulse a circular was prepared almost overnight memorializing the Government to undertake the work. As the statements in this pamphlet led to the assumption that the highway could be constructed for $600.000, I would like to analyze it in the light of present knowledge gained by actual experience. We felt that the commission proposed would operate directly under the Department of Highways, and no provision was made for the overhead expenses of management, engineering, etc. None of us appreciated how greatly the costs of road work other than the actual surfacing can vary. For example, the circular provided $938.70 per mi. for grading and ditches. This sum would probably have paid for the leveling up of the old road and the cleaning out of existing ditches, but it made no provision for changes in existing grades or bridges and culverts, or for the installing of any tile drains. About 94% of the proposed cost was to have gone into the road surface.

In the highway as constructed, a roadway of from 12 to 15 ft. has been graded to a minimum width of 26 ft. Many hills and hollows have been improved. The maximum grade has been reduced from 10% to 4%. More than 50 bridges and culverts with spans up to 50 ft. have been reconstructed or enlarged. More than 35 mi. of tile drains have been laid. Many improvements in location have been introduced—bad curves have been eliminated or improved—telephone, telegraph and hydro poles, radial tracks and other obstacles have been removed. The cost of the road surfacing represents approximately only 50% of the total cost. In fact, much of the work done should be considered as done for all time to come. The increase in width of pavement from 16 to 18 and 24 ft. has increased the total yardage by almost 20%. The statement was based on the completion of the work in 1915, and the commission's contracts were placed with that idea in mind. The work has been done by day labor and the commission has had to increase its hourly rate for labor by 75%. The market price of the most important materials has increased by nearly 60%. The cost of commissary supplies has almost doubled. Some of the other supplies have cost nine times as much as in 1914. None of us have ever seen a similar change in conditions in such a short period.

But let us get back to the story of construction.

The chief engineer reported Nov. 4, 1914. Our instructions to him on account of the pressing needs of the unemployed were to start actual construction as quickly as possible. The first work was done Nov. 8. Grading continued during the winter, gangs being changed fortnightly in order to offer some work to as many men as possible. Serious difficulties arose in connection with the securing of proper yard accommodations, the railway being slow to allow anything which might interfere with traffic on the busy Toronto to Hamilton section. While it was intended to have the yards in shape to operate by Jan., 1915, they were not ready until July. This fact seriously inconvenienced progress in 1915, for it prevented the opportunity to store sand and stone during the early spring before the laying of the concrete had been begun. Limited quantities were stocked, and the first concrete was laid on July 21. An unprecedented period of wet weather occurred, as it rained on 37 of the 40 days following July 15. (Saint Swithin's Day.) Many of the storms were very heavy, that on Aug. 4 being the heaviest known for more than 50 years. They greatly hampered our own work, and made it practically impossible for sand pits to be operated. Conditions improved in September, however, and on account of an unusually mild fall, work was continued until well into November, about 16 mi. of concrete being laid—the most important stretches extending from Burlington to Hamilton and from Oakville to Clarkson. Almost all of the heavy grading west of the Etobicoke was completed this season. The maximum number of men employed was at times slightly in excess of 1,000, but up to the end of 1915, 3,983 men had applied to the commission for work and 3,430 had actually been employed. Until late in the season only British subjects were engaged. Before the end of the year almost 300 had left to join overseas regiments. The only work carried on through the winter was the replacing and extending of bridges and culverts.

The spring of 1916 was cold and wet, the weather not settling until June 21. Sufficient stocks of sand and stone were on hand, however, and the work west of the Etobicoke would have been completed earlier in the fall if labor shortage had not interfered seriously with the regularity of the cement shipments. The working force this season did not exceed 600 men and many of these were drawn from northern Ontario only after the most strenuous efforts. It was not unusual for as many as twelve representatives to be in the field at once competing for the men. Some of the contractors were from as far east as Halifax. After they reached the work they had to be held in competition with the manufacturers in both Toronto and Hamilton. Late in the fall the highway was opened for traffic from the Etobicoke Bridge westerly to the limits of the City of Hamilton.

Why has the Toronto end been left to the last? The question has been asked not once but many times. Has the commission a satisfactory explanation for this delay? These are our reasons:

During the summer of 1914, the Department of Highways made a preliminary survey of the Lake Shore Road, which was completed before the commission was formed, and which was the only basis for the early work of the commission. Largely on account of the fact that a Dollarway pavement had been constructed for the first 2 mi. out of Toronto, and the belief that contracts had been let or were pending for additional work, this survey did not begin at the boundary of Toronto at the Humber, but at the westerly boundary of New Toronto instead. When the commission was advised Oct. 16, 1914, that upon obtaining agreements with the cities of Toronto and Hamilton, the work could be proceeded with, the matter was at once laid before the two councils, Toronto's agreement being received Oct. 26 and Hamilton's, Oct. 27. Negotiations were then opened with the York Highway Commission, regarding the York County section. When construction work began in Nov., 1914, it was very evident that the greatest need for relief work came from Toronto, and when arrangements were made regarding the transportation of the Toronto men, tickets were printed for various points in York County, but the failure to agree with the York Highway Commission prevented getting the work under way.

Early in 1915, delegations from Mimico and New Toronto appeared before the commission, outlining a plan for a highway 86 ft. in width, radial tracks in the central portion and two paved roadways. They also said that the two municipalities were installing joint sanitary sewers and a disposal plant, and completing a water system. The commission recognized the advantages of the wider highway, but doubted the desirability of a form of construction which would require traffic to cross the radial tracks at the limits of Mimico and New Toronto. They felt that the same form of construction should be adopted throughout the county. Estimates were prepared, but no agreement could be reached as to the basis of distributing the cost.

The commission's survey showed how serious the situation on this section of the highway was. East of Church St. in Mimico, none of the roadway was 66 ft. in width, the narrowest portion being only 38 ft. There were some very dangerous curves. The Toronto and York Radial Railway complicated matters still more. Their tracks were on the highway. Their rights were not clearly defined. Some of the municipalities interested desired provision for double tracking, others felt that they should be removed entirely from the highway.

With these difficulties facing them and having in mind that the York Highway Commission had already incorporated the Lake Shore Road to the county line in their plan of improved roads, the commission looked for another solution to its problem and proposed a variation from the original route plan. The new location would have taken the highway under the Grand Trunk Railway near the Etobicoke, crossed the farm lands just east of the Etobicoke diagonally, and joined up with Queen St. It was slightly shorter than the Lake Shore Road, and could have been constructed for less money than an adequate solution to that route. It would have opened up a new farming district to the Toronto market, and would have been practically free from intersecting streets—to the great advantage of through traffic.

This proposition was not received kindly by the City of Toronto, or by those in the vicinity of the two routes. The commission reluctantly abandoned this scheme, and turned its attention once more to the Lake Shore Road. It felt that the addition of the great amount of local traffic in this section to the large and growing through traffic would make the construction of a roadway of the standard width little short of criminal. As no mutually satisfactory arrangements could be arrived at, the commission made application to the Ontario Railway and Municipal Board for permission to widen the concrete roadway to 24 ft. from the western boundary of O'Connor Road to the Toronto line. The board's decision ordering a wider roadway was issued June 22, 1917.

The installation of sewers and water works in Mimico and Now Toronto prevented the possibility of highway construction during 1915 and 1916. It was planned to have all the trenching on the Lake Shore Road completed by Dec. 1, 1916, however, which would have given some chance for the backfilling to settle. Delays prevented this schedule being followed.

Weather conditions in the spring of 1917 were again very unfavorable to outdoor work. Rain fell almost every day until July 19. The wet weather in combination with the heavy clay soil and the network of newly filled trenches interfered very seriously with the progress of the grading. In addition. the work on the New Toronto sanitary sewer moved along very slowly, and as the portion undone was just opposite the commission's yard the commission itself finally completed the backfilling of the trench in order that concreting materials could be hauled to the roadway and the laying of the concrete begun.

The first mixer was started July 18. The weather now settled, and good progress was being made, until like a bolt from the blue sky came the order restricting the use of cars in the stone trade. The commission urged the necessity of finishing up the roadway this season, but could not urge its claim in opposition to that of the people of Canada, for coal. Three weeks of ideal weather were lost before stone shipments were resumed, and the opening of the roadway delayed for at least that period.

In presenting its estimates in connection with the application made to the railway board to widen the roadway, the commission included items covering the cost of storm sewers, catch basins, boulevard grading and curb work. It was held, however, that this work was optional with the municipalities. Mimico and New Toronto requested that this special work be done, but in Etobicoke Township, east of the town of Mimico, the commission found itself in the position of having to acquire land at considerable cost, utilize a large portion of it for an undesirable open ditch construction and place the concrete roadway in such a location as to make it extremely likely that it would have to be torn up within a few years if that section should develop to the extent that the commission anticipates. Many meetings were held with the Township Council and the ratepayers in that section, but it was not until Sept. 13 that an agreement was reached under which the work could proceed. As the laying of the concrete in this section was completed Oct. 28, we feel that fair progress was made, especially since it was necessary to acquire land, move three pole lines and the radial tracks, in addition to the regular grading and concreting in that period.

The work has been continued later this fall than we feel is desirable, but the two cities are now joined up and if

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War Work of the State Highway Departments[*]

By G. P. COLEMAN[†]

During the past twelve months I have attended a number of conferences covering road matters. On January 5, together with the executive committee, we took up with the secretary of agriculture the use of convicts in connection with federal aid work. The secretary accepted the suggestions as made by your committee, and his rulings have made possible the use of prisoners on federal aid work on very favorable terms. Dr. Pratt, our secretary, has sent you from time to time copies of these rulings. At this conference it was decided not to ask Congress to amend the federal aid road act at that time, but to give the various departments an opportunity to work under the present law and the regulations of the Department of Agriculture, and then to suggest changes and modifications. This question comes up for discussion at this meeting, and, I hope, will receive very careful consideration. The act as a whole, I believe, is good, and I question whether any of us have had work going on for a sufficient length of time to be in a position now to criticise it constructively.

On March 22 the executive committee had an interview with Colonel Winslow of the War Department, and at his request had prepared, by the various state highway departments, lists, giving names and addresses of all highway engineers and contractors, together with a list of all road machinery, teams, tools, etc., and the location of the same; also maps of the various states, showing the location of quarries, gravel pits and other road materials, together with their output. The greater part of this information was forwarded the War Department in May, and, judging from results in Virginia, must have been found very valuable, for they have taken over the majority of our public quarries and pits, and have left us practically without materials, either for road construction or maintenance purposes, except materials of a strictly local character.

Early in May we took up with the War Department the advisability of using war prisoners for road purposes, and after a general discussion of the question we were advised that the secretary of war was giving the question of using these prisoners on public work serious consideration. On September 12, I attended a conference of several highway commissioners, called by Dr. E. Stagg Whitin, Chairman Executive Council, National Committee on Prisons and Prison Labor, at which time we prepared, at the request of Secretary of War Baker, a plan covering the use of war prisoners now in this country on public works. The administration has not given a ruling on this important question—one which I believe will go far towards relieving the present labor conditions, particularly on road work. I trust that we will have a general discussion of this question at this meeting.

In June I took up with Senators Chamberlain, Martin and Bankhead the Chamberlain-Dent Marginal Road Bill (the construction for military purposes of a marginal highway by the War Department). I have been advised that this bill will come up again at the coming session of Congress, and that there is every reason to believe that it will be favorably acted upon. This, too, is an important question, which should receive consideration from us at this time, and we should determine just what support the association will give this bill.

On June 13, and again on July 24, we had a conference with the Car Service Committee of the National Council of Defence to discuss the car shortage situation, and, if possible, to obtain some relief. A letter covering the result of this conference was sent out to the various departments.

On November 1 we had a conference with Mr. Kirtley, assistant to Judge Lovett of the Priority Committee, covering their now famous Order No. 2, affecting the shipment of road materials in open top cars. Mr. Kirtley was unwilling to give any promise of relief in this matter, simply stating that they would use every effort to lift the embargo as soon as possible. This question is the first topic on our program for this afternoon, and is undoubtedly the most important problem confronting road interests today.

At the request of Dr. Clarke of Maryland I appointed a committee from the Atlantic and Gulf states to cooperate with the state geologist in preparing a report covering road conditions and the location of materials requested by the War Department. This report covered very much the same ground, possibly a little wider field, as the report gotten up by this association in May for the same department.

A great many changes have taken place in the world since our St. Louis meeting of last year, affecting all of us and bringing the road builders of this country face to face with new questions and conditions. A great many of these questions, which are of vital interest to us, will come up for general discussion, and I hope that some solutions of these problems which are confronting the road builders of the country may be found.

Possibly the most important question which is before us at this time is "How can the highway departments of the various states best serve the country in the present crisis?" The answer is not an easy one, since practically all the forces of the world are being used to carry on the present war, a war of unparalleled horror, but also of such unparalleled justice and right, so far as our own nation is concerned, that we cannot relax until the triumph of our cause is complete. All the energies of man today are given to the construction of engines of destruction, and our world seems, in its effort to save civilization, to have become possessed by the spirit of war that blinds it to the fact that this strange era is an abnormal one; that it must pass and the "star of peace return," ushering in a day when the problems of normal life will assume an even greater importance than ever before. There is no doubt that many of the strange, new experiences through which we are passing have affected our mental processes for the worse. Cheap clap-trap and appeals, which a short time ago we would have passed by, or treated with derision, now stir us with frenzy. Let us, then, as far as possible at this time, prepare our forces and organize our resources for that peace which we know must come in the end, reversing the saying, "In time of peace prepare for war," and make our motto, "In time of war prepare for peace." When that peace comes each country will have its own peculiar problems to solve, and foremost among these will be highway transportation. We know even now from the administrative rulings that railway and water transportation are inadequate, and as a matter of fact are breaking down under present transportation conditions, and that they are calling on the highway departments of the states to provide relief, which, however anxious these departments may be to give, has been made almost impossible under existing orders and rulings. These conditions we must prepare to meet, since every interest of the country is dependent on the improvement of its highways for proper expansion

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[*] From the annual address of the President of the American Association of State Highway Officials, at the annual meeting, Richmond, Va., Dec. 4-6, 1917.

[†] State Highway Commissioner of Virginia; President, American Association of State Highway Officials.

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

December 15, 1917

WHY WE MUST BUILD ROADS

A letter emphatically disagreeing with the position taken by "Good Roads" in regard to road building during the war is printed on another page of this issue. The statements to which particular exception is taken were contained in an editorial entitled "An Ill Considered War Measure," which appeared in the issue of November 3.

Since a state of war between the United States and Germany was declared last April, "Good Roads" has consistently and continuously urged active road work—not as road work per se, but as a war measure. It is just that distinction that Mr. Dappert, the writer of the letter referred to, seems not to have understood.

We are in entire accord with his contention that: "Either we must stop unessential developments or stand a chance of defeat." There is at present one great task before the American people; we must win the war. We can win and we shall win. We could win speedily by putting into the effort every resource we possess in brains, men and money. If the United States would attack the problem with the same concentration and energy that some private business enterprises employ, the war would soon end in a complete victory for the Allies.

But even such a program would not—if properly formulated—entail a stoppage of road work. On the other hand, it would call for very great activity in the building and maintaining of highways.

Transportation has made possible the industrial, commercial and social progress of civilization. It has played a great part in war. In the present war it has enabled Germany to hold for nearly three years the enormous advantage gained in the first drive, in which, too, the rapid mobilization of troops and supplies was made possible only by a transportation system laid out, built, maintained and operated with that very contingency as its chief object. How great a factor transportation has been in this war no one knows; perhaps will never know.

Transportation, of course, includes transportation of all kinds—rail, water, highway. The last named is primary transportation and upon it other modes depend. Other methods are all but useless without it, though highways alone could meet all but trans-oceanic transportation requirements were they called upon to do so.

Winning the war is going to tax every resource of the country—the railroads are already over-burdened. Highways must carry more and more traffic. The country must look to the motor truck for a solution of its pressing transportation problems, and that means that we must have roads. Those already in condition to carry traffic must be kept so. Unimproved roads must be put into condition.

Road building must be put on a war footing, in other words, must be speeded up and directed with a view to the peculiar needs of the time. The roads most important in the present crisis must be put into condition to carry heavy traffic and must be kept in that condition. The sooner we take care of our transportation problem, the sooner will we be in a position to restore normal conditions in a war-racked world.

THE A. R. B. A. CONVENTION

The plans for the coming convention of the American Road Builders' Association at St. Louis, Mo., so far as they have been announced, should meet with the approval of every road builder.

As is stated elsewhere in this issue, the organization will hold its annual convention this year as usual, but the exhibition features will differ in several important respects from those held during the past few years. Beginning with the Columbus convention in 1909, it has been the practice of the American Road Builders' Association to bring together each year at the time and place of its annual meeting, a display of machinery, materials and tools used in the construction and maintenance of roads and streets. These exhibitions have always included much heavy machinery, some of which had to be shipped by rail from long distances. There can be no question that this road show, as it has been called, has been of inestimable advantage both to the buyers and sellers of machinery and materials. Such an exhibition would perhaps have been more valuable than ever this year, for the shortage of labor which has obtained for several seasons has turned the attention of contractors more than ever to labor saving machinery. At the same time it has seemed best, because of the present freight congestion, to replace this elaborate exhibition with an exhibition of materials, photographs, models, literature and the like in the ball-room of the hotel in which the delegates will gather for the business and technical sessions of the convention.

For the same reasons that would make an exhibition especially valuable this year, there is urgent need for a large and representative gathering of those who must build the country's roads. More and more the transportation requirements of the country will have to be met by the motor truck; and motor truck transportation, of course, means that roads must be provided. Road builders, therefore, are to have a great opportunity for service, not only while the war lasts but in the period immediately following its close.

Again, road builders have never been confronted by so many serious problems as they now face. Labor is hard to get, unsatisfactory and costly; higher prices have to be paid for materials; and the difficulties of obtaining shipments of materials are almost insurmountable. Under these conditions, road builders will find many topics to discuss besides the technical and administrative problems to the consideration of which conventions are usually devoted.

Everything considered, there has never been in the history of the American Road Builders' Association a greater work to be done or a greater opportunity to render distinguished service by doing it.

The Toronto and Hamilton Highway

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some extra maintenance work is required we believe that fact will justify its cost.

Our second year of maintenance closed Oct. 31, 1917, and the results only serve to emphasize the conclusions that could have been drawn last year. When we are freed from the excessive cost of maintaining the short stretches of macadam at bridge approaches the cost of repairs to the road surface will be almost negligible. On 312,100 sq. yd. of concrete (approximately 30 mi.) the commission spent in 1917 on tarring cracks and joints a total for labor and materials of $767.70. When this is contrasted with a cost of $5,932.12 for repairs to 7,900 sq. yd. (approximately ¾ mi.) of macadam, the folly of macadam construction on a main highway approaching or connecting the larger centers of population is quite evident.

The shoulders and slopes of cuts and fills have been seeded. The signs at the worst turns have been electrically lighted. The grass and weeds have been cut, the ditches cleaned out, the shoulders maintained and snow removed, keeping the highway open to traffic throughout the winter. The commission had hoped to begin the construction of pathways and the placing of some stone on the shoulders this season, but the scarcity of labor and the difficulty of securing suitable materials prevented the undertaking of this work.

Thanks largely to the contributions from our reckless motorists we are in a position to advise the representatives of the municipalities responsible for maintenance that our income has exceeded our outlay by almost $6,500, and that no accounts will be presented to them for maintenance for the year ending Oct. 31, 1917.

The commission feels that the construction of the roadway is practically completed. It is hoped to begin the replacement of the Mimico, Etobicoke, Port Credit and Bronte bridges just as early in the spring as weather conditions will permit. The erection of a high level bridge at Oakville and the completion of the Hamilton entrance are awaiting the convenience of the municipalities interested. We hope that our plans for betterment will lead eventually to a satisfactory pathway on at least one side of the roadway from end to end, the replacing of all open ditches by tile drains which will permit a graded roadway at least 30 ft. in width and the addition of shoulder material so that it will be possible to safely turn out for passing purposes at any point. Some of the private approaches and intersecting roads must be improved to reduce the danger from collisions. A double row of shade trees will be planted. Provision must be made to take care of the farmers' booths and community markets so that every inducement will be offered for this direct contact of producer and consumer. Without special encouragement, sales by some farmers have exceeded $100 in a day, and more than $1,500 in a season. Produce has been offered in the community market by farmers living as far as 6 mi. off the highway.

In 1914 the highest traffic count at any point on the Lake Shore Road was 520, of which 262 were pleasure motor cars, 3 commercial motor cars, 199 were horse-drawn pleasure vehicles and 56 were horse-drawn commercial vehicles.

In 1916 a total of 3,254 was recorded, 1,876 being pleasure motors; 142 commercial motors; 271 pleasure horse-drawn and 184 commercial horse-drawn. The corresponding day in 1917 showed a total of 3,840, of which 3,065 were pleasure motors; 107 commercial motors; 148 pleasure horse-drawn and 41 commercial horse-drawn. With this condition before them the commission has endeavored to keep the highway as nearly safe as is possible for this immense amount of traffic. While the total number of summonses issued during the past year exceed 1,900, the number of vehicles operated on the highway exceeds this figure during four hours on many of the busiest days.

The legislation of 1917 with regard to traffic regulations has been put into effect. As before, all of the constables are paid a fixed salary regardless of the number of infractions reported. A summons is issued by a police magistrate with jurisdiction over the entire highway, and is returned to the proper constable for serving within 48 hours after the offence is committed, so that in the usual case the service is made while the circumstances should still be fresh in the mind of the one receiving the summons. The magistrate sitting on the case is responsible only for the hearing of the case, and his fee is paid by the commission whether a conviction or dismissal is registered.

In this, as in all other matters in connection with the highway, the commission is acting only as trustee for the municipalities, and if they wish the regulations modified or the lid entirely lifted they need only to notify us to that effect.

Finally, I wish to express my appreciation of the harmonious relations that have at all times existed between the chairman and the members of the commission, and to offer a word of commendation to the staff that has carried the work to its conclusion. They have been faithful and loyal, not only to us, but to the Empire as well. There are only two men subject to military duty on the present staff, and they are remaining temporarily at the commission's request to aid in completing the cost records.

In constructing what has aptly been described as "the most important section of the most important highway in Canada," the commission has had in mind the returning of full value, dollar for dollar, for the amount expended. It will probably take the future to show how well it has succeeded, but it is willing to leave its case in that court.

Road Building Battalions to Be Formed for Service Overseas

The following telegram was received from Capt. H. L. Bowlby, Regimental Adjutant, Camp American University, Washington, D. C., on Friday, just before going to press:

> War Department has authorized three battalions of one thousand men each to build roads and bridges with 20th Engineers, the large saw-mill regiment. The three battalions are being raised at Camp American University, Washington, D. C., by Col. W. A. Mitchell of the 20th Engineers. Their work in France will consist of laying out logging and saw-mill camp sites and constructing and maintaining roads and bridges from the woods to the mill and from the mill to the distributing depot. Road foremen, quarrymen, rollermen, stationary-enginemen, concrete foremen, bituminous plant and construction foremen, machinists, carpenters, asphalt workers and skilled and unskilled road and bridge labor of all kinds are desired. Enlist at any recruiting office for the 20th Engineers, Road Section. Further information can be obtained by addressing Col. Mitchell, Camp American University, Washington, D. C.

Henry Welles Durham, formerly Chief Engineer of Highways of the Borough of Manhattan, is engineer-officer of one of the battalions.

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The Rocky Mountain Goat, used as a trademark by the Great Northern Railroad, is to be used to mark a highway from St. Paul to Minneapolis to Glacier National Park, according to report. The road will be known as the Glacier Trail and will follow the general route of the Breckenridge Division of the Great Northern.

War Work of the State Highway Departments

(Continued from page 308.)

The country which grudges money for highway work now and in the years to come will find itself called upon to pay dearly for its parsimony, therefore it is the duty of the highway engineers—it is our duty—to concentrate our energies on carrying forward the war by providing highway transportation and in this way serve a double purpose, for we will also be preparing for the conditions which will confront us at the end of the war, when competition will be sharp and the nations of the earth will be competing for the markets of the world. Our work, then, is to build such state systems, or, if you please, a national highway system which will enable us to carry the war on to a successful issue and at the same time prepare our country for peace, and enable us to develop our resources, protect our commerce, extend our interests and take our proper place in rebuilding a world which has been devastated by the forces of war.

Roads Should Be Built

Newspaper Comment on Present Conditions

The following expressions concerning road problems during war-time, to which numerous additions might be made, are of interest:

Men can not foresee what shall go over the roads they build. America has been making highways for her farm products, for her manufactures, for the ores from her mines. Her people have taveled over them on business or on pleasure, or on errands of mercy bent. Now the munitions of war and food for our soldiers and for our allies have the first place. If we have built carelessly for other uses the service of the nation suffers now. * * *

The war has cut down expenditures on this item in many states, though the aggregate, $300,000,000, is higher than the total of 1915. Some of the material used is harder to get and there is not so much available man power. Nevertheless, the nation must take this matter of road building more seriously than it has yet. Like the Romans, we must build roads even in war periods. We have no slave labor, as they had; but slave labor is the most wasteful kind of all. We must build for ourselves, willingly, because we have intelligence enough to know that if our wagon and automobile wheels get stuck in the mud the whole procession will be delayed.—"Evening Sun," New York, N. Y.

The Government is preparing to establish a motor truck route between Chicago and the Atlantic Coast, if the preliminary survey now being made proves it feasible. It is estimated that 10,000 trucks would greatly relieve the freight congestion, which is seriously interfering with the transaction of business.

There is just one difficulty—the lack of good roads.

If the Government had been far-sighted enough a few years ago to build long stretches of military highways, as it is now preparing to do, the motor truck would have been adopted at the outbreak of the war as a traffic aid. But the national highway plan, like state and county highway plans, could get little recognition until now, when the roads are needed most. Unfortunately, good roads can not be built over night. This war must be fought out without them.

In a sudden emergency America must depend upon the trains, or upon such dirt roads as can be used. That means that throughout a large part of the year, the railroads must be relied upon entirely, because the condition of the dirt roads will not permit their use by heavy automobile trucks.

It is a lesson that must not be forgotten when the war is over. IT SHOULD RESULT IN ENORMOUS ACTIVITY IN ROAD BUILDING IN THE FUTURE.—"News-Record," Springfield, Ill.

We have been in the war six months and we are groaning under our transportation burden. Why? No nation has greater transportation resources. We could transport without trouble the greatest army ever assembled by any nation if we determined to do so.

In the Ford motor plant we have the great key to rapid and easy transportation of great military forces.

The Ford factory can turn out 3,000 auto trucks a day.

One auto truck will accommodate eight men with equipment.

One day's output of the factory means transportation for 24,000 men. Ten days' output means transportation for 240,000. Forty-two days' output means transportation for more than 1,000,000 men.

What if America today hasn't highways over which such a force could be transported?

Build the roads. If necessary we could build the roads immediately ahead of the army. Auto trucks could carry stone for roadbed. Auto trucks could carry tar products for durable roads. Pipe lines stretched along the route could supply gasoline.

Don't gasp and say it would be too great a task. The people who conquer are the people who do the things that seem too difficult. By the power of transportation Germany has crippled Italy. By the power of transportation Germany holds the world at bay.

Why don't we take heed? Why are we blind to the great lesson pictured before us?

Have we lost our enterprise, our imagination? Have we no military leader to vision the possibility, the potential power, the necessity for the army truck?

We could build great highways over which we could transport our troops and our supplies for offense or defense, but we do not do it. We could build in the Ford plant, as nowhere else, the vehicles to transport our armies, but we do not do it.

A road 60 ft. wide would accommodate four or five trucks abreast. Traveling 6 mi. an hour for 6 hours and with the auto trucks 40 ft. apart an army of 144,000 men (8 men to an auto) could be transported with ease 36 mi. a day.

And the cars to carry these men would mean but one week's output of the Ford plant.

Caesar conquered Europe by being a great master of transportation. The roads he built endure today.

We might be masters of our own transportation if we so determined. But we are not. Our railroads groan and creak under the load we make them bear. We have congestion throughout the land. We have difficulty in transporting our troops, our munitions, our supplies for ourselves and our allies. We have not adequate highways to strike an enemy at our gates or to mobilize our strength quickly if he got within our gates.

We might build roads, but we haven't.

We might have the cars to transport our armies over the roads, but we haven't.—"Evening Mail," New York, N. Y.

The wise gentlemen in charge of the railroad situation are doing their best and having hard work.

Why not let motor trucks do the SHORT hauling, wherever roads are passable, and let railroads concentrate on the long hauling?

It is the short haul that bothers the railroads.

A long train of freight cars must stop frequently, lose time and block the tracks, dropping one or two cars here and there, to meet the short-haul demand. * * *

Let a committee of railroad men and business men, with careful consideration of the needs, interests and rights of each, look into the question of a SHORT-HAUL embargo.

Where the motor truck can do the work, free the railroad to that extent.

The modern truck with a trailer can carry a load almost unbelievable on any fairly good road. * * *

It is notorious that the small freight shipments, for short hauls, tie up cars, cutting down their value at least 50%. * * *

It is realized by Government and railroads that the latter have not cars enough to carry the freight of the country.

Important industries, built up slowly through long years and of the highest value to the nation, are threatened with destruction because the railroads can not take care of the Government work and at the same time supply these industries, provide for their incoming and outgoing freight.

There is only one solution—TO COMPEL the motor truck to do as much of the nation's freight carrying as possible.

The quick road to this success would be an embargo on the short haul. Let the motor truck take care of freight within 25 to 50 mi. of big cities, and even longer distances. Let railroads concentrate on the long haul—and thus save the constant stopping of trains and shunting of freight trains, save the use of freight cars as storage warehouses on sidings, unload upon the motor truck the hardest, most expensive short-haul work of the railroads and IN SPITE OF WAR, RAILROADS AND MOTOR TRUCKS COMBINED WILL DO THE NATION'S WORK AND MAKE IT UNNECESSARY TO HINDER, CRIPPLE OR UTTERLY DESTROY THE NATIONAL INDUSTRIES.

These industries will be needed when the war ends, and when the task of this nation will be to substitute for fighting with bullets, fighting with business brain.—"Evening Journal," New York, N. Y.

Status of Paving Work in Minneapolis, Minnesota

The cost of paving work completed in Minneapolis, Minn., during 1917 amounted to $503,850, according to a recent report. Projects on which work was not completed amounted to $103,321.

It is expected that in 1918, very little will be done except to complete the work left over from this year.

Work done this year included the construction of creosoted wood block pavements at a total cost of $301,151; brick pavements, $6,659; bituminous concrete pavements, $43,010 and cement concrete pavements, $27,883.

Delay in shipments of creosoted wood block was given by City Engineer E. R. Dutton as the cause of much of the delay during the year.

Federal Aid Road Work in Georgia

Georgia's first year's allotment of federal funds amounting to about $134,000 has been apportioned to various county projects in the state, according to a statement by Chief Engineer W. R. Neel. The Highway Department is making every effort to complete the engineering details of the work at the earliest possible date, in order to turn its attention to the 1918 and 1919 appropriations.

Special efforts will be made, it is stated, to complete the preliminary details of the Atlanta-Macon project, so that funds for the work may be available immediately. The department, it is stated, expects actual work to be commenced on this route about Jan. 1.

At a recent meeting of the commission, various projects for 1918 and 1919 were submitted, but action on these has been postponed until the receipt of reports from the department's engineers.

Adverse Criticism of Continued Road Building

An editorial, printed in "Good Roads" for November 3, protesting against the order forbidding the use of open-top freight cars for the transportation of road materials, was reprinted by the Portland Cement Association and rather widely distributed. One of those receiving a reprint has written to the Portland Cement Association expressing his disagreement with the editorial, and has transmitted to "Good Roads" a copy of the letter, with permission to make such comment upon it as we desire. The letter, which is from J. W. Dappert, C. E., a consulting engineer of Taylorville, Ill., follows:

"The editorials reprinted by you from 'Good Roads' and sent me recently have been received. I do not agree with the article as published. Manifestly, with 6 to 8% of the best portion of our labor conscripted for military duty, and with the further probability of 20% to be taken for direct military purposes, and other large numbers required to keep the army supplied, it is self-evident that some of the industries and other lines of business must suffer. Either we must stop unessential developments, or stand a chance of defeat. Let us bend all our efforts and energies first to saving ourselves from defeat, and when we shall have finally defeated 'Kaiserism' and have made our country and the world 'safe for democracy,' then we will have ample time to build the roads, and make the other needed improvements. If we fail to defeat Germany we will not need the roads, and we will not be allowed much choice in the direction of their improvement. I have four sons in the U. S. Army, and I want to see the whole awful tragedy brought to a final conclusion, and do not want to wait until all the trunk roads of this country are completed for that final consummation. Let us defeat the Kaiser, and all else will then come along in good time."

Practically Unanimous Vote for Bond Issue in a Missouri Road District

The passage of a bond issue for highway improvement in the Williamsburg-Calwood special road district in Callaway County, Missouri, by a vote of 218 to 3, indicates the keen interest felt by the people of that district in securing modern roads, although the amount of the issue, $25,000, was not as large as is frequently passed in highway districts where road improvement has received greater attention.

The adoption of this issue, according to the Missouri State Highway Department, assures the construction of a 14-mi. link on the National Old Trails Road, extending westward from the state road project now under construction in the Mineola special road district in Montgomery County. Immediately west of the new improvement district is the Fulton special road district in which an 8-mi. project lies. The work in the three districts provides for the hard surfacing of 30 mi. of the cross-state highway immediately north of the Missouri River.

Chairman Benson of the Oregon Highway Commission Urges Continuous Road Building

The continuation of work on the country's roads was urged in a recent statement by S. Benson, Chairman of the Oregon State Highway Commission. He believes that suggestions that road work be stopped during the war have usually come from those who have always been opposed to highway development and other public improvements. Chairman Benson is quoted as follows:

"Owing to the necessity of increasing our transportation facilities, it seems to me that it is a high patriotic duty to go ahead with the improvement of our main trunk roads. In this connection I note that the Council of National Defence has appointed a highway transportation committee to work in cooperation with local highway authorities to relieve the burden of the railroads through the development of a greater use of the highways and inland waterways.

"It is proposed to encourage the use of motor trucks for short distance transportation. This would strongly indicate that the National Council of Defence would not approve the suspension of reasonable highway work and further add to the railroad congestion.

"As to the statement that more men would be available for the sawmills and logging camps if road work were suspended, I venture to assert that but few men who are working on the roads would be willing to go into the lumber camps. One per cent. would be a liberal estimate.

"Of course, there is reason in all things. Any unnecessary work should not be undertaken, but where an improvement will be instrumental in enlarging our facilities to bring our food products to market, thus aiding the defence of the nation and assisting our allies, it ought to be continued."

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The Annual Highway Budget of East Hampton, Long Island, has been prepared by Superintendent of Roads J. E. Gay, and submitted to the Town Board. The amount asked for the repair and improvement of town highways and care of culverts and bridges is $31,150, to which should be added the state's appropriation of about $7,000.

The Use of Flat Cars With Side-Boards for the carrying of road surfacing material to complete work already under way has been proposed by State Highway Commissioner Babcock, of Minnesota, to overcome the obstacles to road building created by the issuance of Priority Order No. 2, restricting the use of open top freight cars for the shipment of road materials. In reference to the situation, Commissioner Babcock states that he believes it is advisable under present conditions to hold back work on new surfacing until next spring, when conditions may be expected to be more favorable.

MEETINGS

Calendar of Coming Meetings

Jan. 12, 1918.—Northwestern Society of Highway Engineers.—Annual meeting, Benson Hotel, Portland, Ore. Secretary, C. G. Reiter, Hillsboro, Ore.

Jan. 15-17, 1918.—Virginia Good Roads Association.—Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

Jan. 22-24, 1918.—American Wood Preservers' Association—Annual meeting, Chicago, Ill. Secretary F. J. Angier, Baltimore & Ohio Railroad, Mount Royal Station, Baltimore, Md.

Feb. 7-9, 1918.—American Concrete Institute.—Annual convention, La Salle Hotel, Chicago, Ill. Secretary H. B. Alvord, 27 School St., Boston, Mass.

Feb. 8-9, 1918.—American Concrete Pipe Association.—Annual convention. Sherman Hotel, Chicago, Ill. Secretary, J. H. Libberton, 208 S. La Salle St., Chicago, Ill.

April 15-17, 1918.—United States Good Roads Association.—Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

April 18-19, 1918.—Bankhead National Highway Association.—Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

American Road Builders' Association

The fifteenth annual convention of the American Road Builders' Association will be held at St. Louis, Mo., next February, as was announced in last week's issue. Since that announcement was given out by the association, it has been decided to hold the meeting at the Hotel Statler during the week of Monday, Feb. 4.

For patriotic reasons the directors have decided to substitute for the usual road show comprising an elaborate and extensive exhibition of heavy machinery, road materials, tools and equipment of all sorts, an exhibition of models, photographs, literature and such other displays as can be assembled without burdening transportation facilities.

Officials of the Road Builders look forward to a big convention, pointing out that at no time in the history of the country has road work assumed its present importance. Not only is the necessity for roads more urgent now than ever, but never have road builders faced more numerous and perplexing problems than now confront them. For these reasons a representative gathering of the road builders of the whole country is needed. They will need to discuss not only the technical problems always before them, but, in addition, the ways and means of overcoming the hindrances to their work arising from the war.

It is felt that the coming St. Louis meeting offers opportunities for patriotic service such as have seldom presented themselves to any body of workers.

American Association of State Highway Officials

As noted briefly in last weeks' issue, the annual meeting of the American Association of State Highway Officials was held at the Hotel Jefferson, Richmond, Va., on Tuesday, Wednesday and Thursday, December 4, 5 and 6. The meeting was one of the most largely attended of those held by the organization. The program of technical papers, which was printed in full in "Good Roads" in November, was followed very closely. The presidential address appears on other pages in this issue. Other papers will be printed in later issues.

The delegates were welcomed to the convention city by Mayor Ainslie, the resonse being made by A. D. Williams, Chairman-Engineer of the West Virginia State Highway Commission, after which the meeting took up the technical and administrative matters scheduled in the program. The first day was largely devoted to a discussion of conditions brought about by the war, and the second day to the consideration of federal aid, the last day being reserved for technical construction and maintenance problems.

A tour of the city, in cars furnished by the Richmond Automobile Club, was made on Tuesday afternoon. The annual dinner of the organization was held on Wednesday evening.

The report of the resolutions committee, which was adopted by the meeting, follows:

We, your Committee on Resolutions, beg leave to report as follows:

1. WHEREAS, a state of war exists between this country and Germany and Austria, this association heartily endorses every step taken for the successful prosecution of the war and pledges its whole-hearted and enthusiastic support to President Wilson and to all Government officials charged with the conduct of the war.

2. This association congratulates Dr. Pratt, the secretary of this association, and all those of its membership who have enlisted in active war service and extends to them its very best wishes for their success and for their safety. We believe that the fact that at least 20 per cent. of all employees engaged in state and federal highway work have enlisted is the best evidence of the patriotism of highway officials and of highway engineers.

3. We believe that while every effort of every industry and occupation must be first directed towards carrying this war to an early and successful end, nevertheless the prosecution of highway work is essential, both as a war measure and as an economic measure, and that the adoption by the nation, by the states, or by other municipalities, of a policy of half-hearted prosecution of highway work would be an irrepairable blunder. We recommend to the several states care in the selection of improvements so that there shall be first improved those roads of the greatest economic value in th epresent crisis. From developments so far, it seems inevitable that the present means of transportation will become utterly inadequate and must be supplemented by motor transportation over the main arteries, and every step must be taken to put these arteries in condition to take and to withstand this traffic.

4. Especially do we commend to all highway officials an intensive program of maintenance. Roads which have been built must be saved, and we trust that the executive committee will use every effort to insure that the national authorities give esepcial consideration to the movement of all materials to be used in maintenance.

5. We recommend that in the present emergency all convicts and other prisoners, the harmlessly insane, war prisoners, and alien enemies be used in so far as possible in industry and in road construction, and urge legislation to this end.

6. We recommend to all highway departments a campaign of education and publicity so that all the people may be fully informed of the necessity, particularly at this time, of continuing a sane program of road construction and intensified maintenance and of the important place these matters have in the program of prosecuting the war.

7. We reiterate our faith in the federal aid road act. and believe that it has done more for the cause of road improvement than any other one influence has ever done. We do not believe that amendments to it should be urged or made until it has been fully tried out in its present form. We respectfully urge upon the U. S. Department of Agriculture a more liberal interpretation of its provisions and that the authority of the district engineers in regard to projects, plans, and construction be extended, so that the purposes of this act may be accomplished with the minimum delays.

8. We commend the appointment of the Highways Transport Committee by the National Council of Defence and express our appreciation of the attendance and the address of its chairman,

Mr. Roy Chapin, and we urge this committee to give immediate consideration to all problems coming up in the present emergency, and urge them to give us every help possible in securing for road improvement and maintenance the consideration due these great necessities at this time.

9. We call the attention of the executive committee to the fact that road improvement rests in a large measure upon the marketing of state and other municipal bonds, and we suggest that they take such action towards enlarging the salability of such bonds as they may find advisable and necessary.

10. We recommend most earnestly uniform legislation regulating motor traffic over public highways in the United States to the end that these highways may be constructed and maintained without unnecessary expense to the public.

11. We thank the Richmond Automobile Club, the Westmoreland Club, the Country Club, the press of Richmond, the management of the Hotel Jefferson, and all others who have contributed to make our stay in Richmond both profitable and pleasant. The well-known hospitality of Richmond has come up to expectations, which is the maximum praise. We especially thank Miss H. M. Berry, Dr. Pratt's able assistant, for her efforts on behalf of this association, both before and at the present meeting.

Members of the Committee on Resolutions were: A. R. Hirst, State Highway Engineer of Wisconsin; Ira R. Browning, Secretary and State Road Engineer of Utah; Charles J. Bennett, State Highway Commissioner of Connecticut; Paul D. Sargent, Chief Engineer of the Maine State Highway Commission; S. E. Bradt, Superintendent of Highways, Illinois Department of Public Works and Buildings, and W. S. Keller, State Highway Engineer of Alabama.

Officers for 1917-18 were elected as follows: President, W. D. Uhler, Chief Engineer of the Pennsylvania State Highway Department; Vice President, A. R. Hirst, State Highway Engineer of Wisconsin; Secretary, Joseph Hyde Pratt, Secretary of the North Carolina State Highway Commission; Acting Secretary, A. D. Williams, Chairman-Engineer, West Virginia State Highway Commission; Treasurer, F. F. Rogers, State Highway Commissioner of Michigan.

Executive Committee: 1-year term, Ira R. Browning, Secretary and State Road Engineer, Utah State Road Commission; 2-year term, Max L. Cunningham, State Engineer of Oklahoma; 3-year term, Paul D. Sargent, Chief Engineer, Maine State Highway Commission; 3-year term, W. S. Keller, State Highway Engineer of Alabama; 4-year term, Charles F. Stern, Member California State Highway Commission; 5-year term, George P. Coleman, State Highway Commissioner of Virginia; 1-year term, E. A. Stevens, Member, New Jersey State Highway Commission, and Edwin A. Duffey, State Commissioner of Highways of New York.

PERSONAL NOTES

Neil Coventry has been appointed City Engineer of Harrison, Idaho.

Maj. Robert G. Thomas has been elected chairman of the South Carolina State Highway Commission, succeeding Maj. J. M. Johnson.

B. C. Wells has been appointed City Manager of Eldorado, Kansas. For the past eight years, Mr. Wells has been City Engineer of Wichita, Kansas.

J. E. Nelson, who has had charge of road construction in Clatsop County, Oregon, has been placed in charge of state highway work at Wolf Creek.

Capt. A. J. Latornell, formerly City Engineer of Edmonton, Alta, is reported to have died of wounds received in action. Capt. Latornell was a lieutenant in a Cobourg battery.

J. McCready has resigned as Municipal Engineer of North Vancouver, B. C.

R. B. Lee has been appointed City Engineer of Hutchinson, Kansas, to succeed Capt. G. L. McLane, resigned.

H. E. Anchutz, formerly with the Florida State Highway Department, is now connected with the State Highway Department of Georgia.

J. H. A. Brahtz has been retained to act as consulting engineer for the bridge to be built by the city of Rochester, Minn., over the Zumbro River.

Capt. G. L. McLane, formerly City Engineer of Hutchinson, Kansas, is now Regimental Adjutant of the 110th Engineers, Camp Doniphan, Oklahoma.

P. F. Brockway, formerly Assistant City Engineer of Wichita, Kansas, has been appointed City Engineer of that city to succeed B. C. Wells, resigned.

John M. Malloy, formerly County Engineer of Scott County, Iowa, has been commissioned a second lieutenant in the National Army and is stationed at Fort Snelling.

E. B. Tourtellot, for the past eight years County Engineer of Clayton County, Iowa, has been appointed Maintenance Engineer of the North Dakota State Highway Commission.

George D. Whittle, of the U. S. Office of Public Roads and Rural Engineering, Washington, D. C., has been transferred to San Francisco, where he will direct the work of federal and highway bridge building in the West.

Thomas W. Cothran, of Greenwood, S. C., has been appointed a member of the State Highway Commission of that state, a vacancy having been created by the resignation of Maj. J. M. Johnson, the former chairman. In the issue of December 1, it was incorrectly stated that Mr. Cothran had been made chairman of the commission.

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The Bryant Paving Co., of Waterloo, Ia., is repairing a total of 26.006 sq. yd. of asphalt pavement in Des Moines. Work will be done on the seven streets which were paved by the company in 1912 with a guarantee of five years.

Highway Work in California will not be entirely suspended by the embargo placed upon open-top cars, according to a report to the effect that through the utilization of the motor truck for delivering building materials the work now under contract can be continued.

The Work on Sumner St., in Middletown, Conn., has been completed under the direction of State Supervisor of Roads Herbert W. Ellsworth, and the highway was opened to traffic last month. The road provides an alternate route when the meadow road is closed by spring floods.

Observations Made by the Utah State Road Commission regarding gasoline consumption by motor vehicles show that on an unimproved highway motor trucks hauling construction material used 18 to 25 gal. per day. After the pavement was put down the quantity of gasoline consumed per truck per day was reduced to from 12 to 15 gal.

The North State Highway in Montgomery County, Missouri, may be improved, according to report. It is said that a proposition has been made to the State Highway Commission that if it will grade and oil the road to Martinsburg, Montgomery County will grade and oil the remainder of the road through the county. The improvement of this road would give two good highways through the county, the Daniel Boone Trail and the North State Highway.

"The Aggressive Work of the Missouri State Highway Department in bringing about the material improvement of the public roads in Missouri, thereby reducing the cost of transporting the products of the farm to the market centers," was commended in a resolution adopted at the National Convention of the Grange, held recently in St. Louis, Mo. C. O. Raine, a member of the State Highway Board, is master of the Missouri State Grange and was given a prominent place on the program at the meeting. In his speech he outlined the plans of the State Highway Department.

EQUIPMENT — TRADE — MATERIALS

Concrete Mixer Embodying New Driving Principle

A concrete mixer in which a new method of driving the drum is embodied is shown in the accompanying illustrations.

The machine consists of a mixer, power plant and loading device, mounted on a 4-wheel truck. It is furnished with either a steam or gasoline engine and with either a power loader or a charging platform.

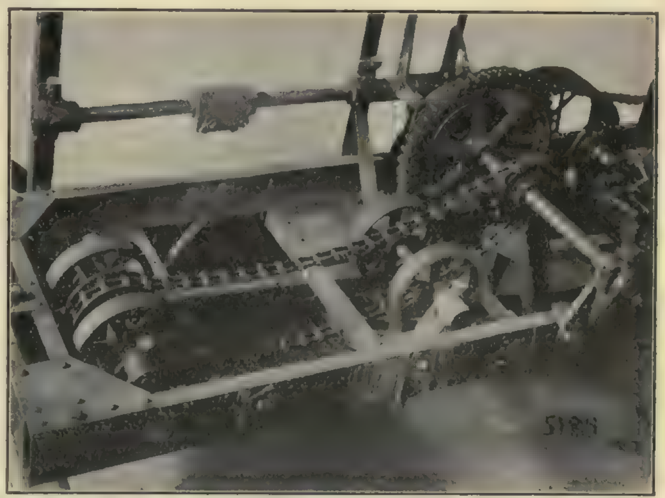
The chief point in which the mixer differs from others is in the driving mechanism. This is shown in the smaller illustration. The mixing drum is chain-driven, but the chain, instead of encircling the drum, passes under the truck frame, around an idler pulley on the roller shaft and back under the drum, where it engages with the drum sprocket ring. It is claimed for this arrangement that the weight of the drum keeps the chain tight and so prevents slipping; that wear on the chain, sprocket teeth, rollers and roller bearings is greatly reduced, and that as the chain does not go around the drum there is a reduction in the loss of power through friction.

The truck frame consists of 6-in. channels, and 2½ x 2½ x 5/16-in. angles. The front wheels are 20 in. in diameter and the rear wheels 24 in., both having 6-in. tires. The wheel base is 8 ft. and the gauge, center to center, 5 ft.

The mixer drum is 45 in. in diameter and 31 in. wide. It has a capacity of 7 cu. ft. of mixed materials or 10 cu. ft. of loose, unmixed materials. The feed opening is 22 in. in diameter and the discharge opening 16 in.

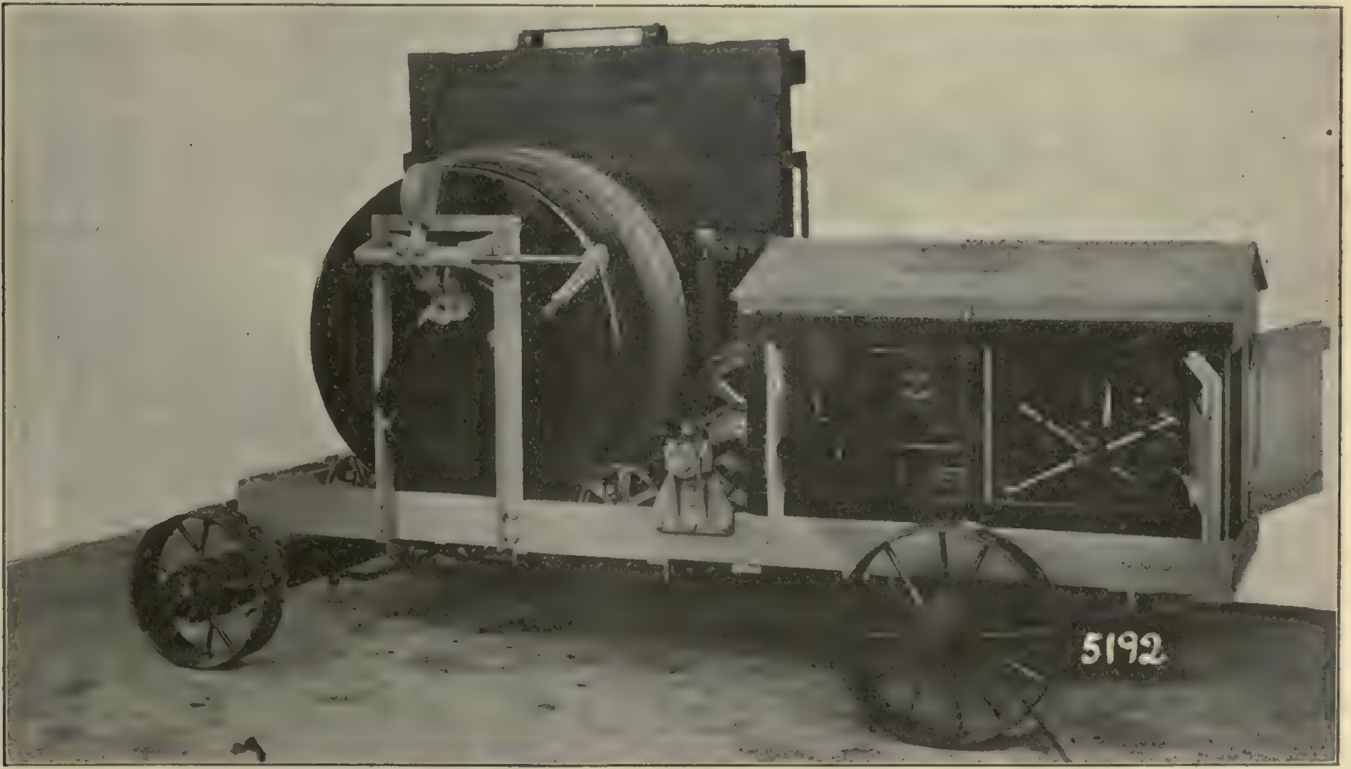
A 5 HP. boiler and 4 HP. engine are supplied on the steam-driven machine. The boiler is 30 in. in diameter, 61 in. high, without the stack, and has 30 tubes. The engine has a speed of 300 r. p. m., a 4-in. bore and a 5-in. stroke. The machine illustrated is equipped with a 5 HP. gasoline engine of the hit and miss type. It has a speed of 450 r. p. m., a bore of 5 in. and an 8-in. stroke. The gasoline tank has a capacity of 5½ gal. and the fuel consumption is rated at 5 pints per hour.

The model shown in the illustration is equipped with a loading platform which can be hooked up against the drum, as illustrated, when the machine is to be moved. The platform is of wood, 5 ft. square and 18 in. above the ground. Two plank runways, each 10 ft. in length, are furnished with the machine. The power loader furnished is of the pivoted type and has a skip of 10 cu. ft. capacity. It can be raised in 8 seconds and discharges at an angle of 50 degrees.



DETAIL OF CHAIN DRIVE UNDER DRUM—NEW SMITH-CHICAGO MIXER, NO. 7-S.

A self-locking discharging chute is another feature of the



NEW SMITH-CHICAGO MIXER, NO. 7-S—GASOLINE DRIVEN, LOW CHARGING MODEL.

construction for which special advantages are claimed. As soon as the chute enters the drum the toggles lock automatically and the chute remains in position until thrown out by the operator. On the power loading machine the discharge can be operated from either the discharge or feed side of the mixer.

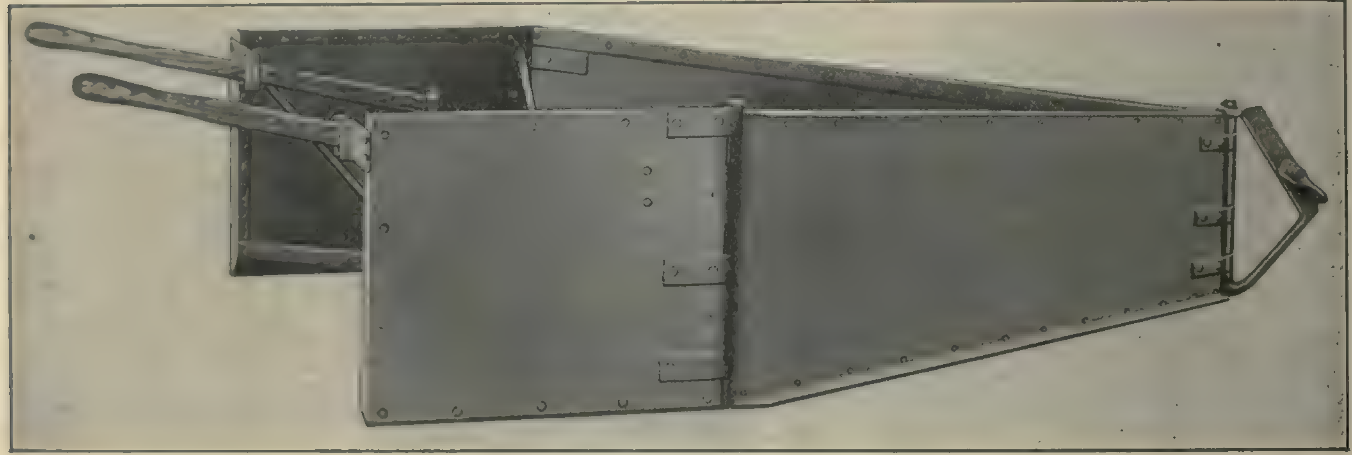
The over-all dimensions of the machine are as follows: Length, without wagon pole, 11 ft. 3 in. width, platform down, 10 ft., platform up, 5 ft. 10 in., loading skip down, 10 ft. 6 in., loading skip up, 7 ft. 2 in.; height, platform up, 7 ft., platform down, 5 ft. 8 in., loading skip up, 8 ft. 8½ in., loading skip down, 7 ft. 8½ in. The weight of the low charge model, with steam engine and boiler, is 4,715 lb., with gasoline engine and house, 4,285. The model equipped with a power loader and a tank weighs 5,475 lb., with steam engine and boiler, and 5,045 lb. with gasoline engine and house.

The machine is designated as the No. 7-S Smith-Chicago mixer, and is manufactured by the T. L. Smith Co. of Milwaukee, Wis.

Adjustable Steel Snow Plow

A snow plow adjustable to various widths and designed especially for use on sidewalks is shown in the accompanying illustration.

The plow is made entirely of steel, with wooden handles, and weighs 350 lb. By changing two bolts it can be adjusted to the following widths: 4 ft., 4 ft. 6 in., 5 ft., 5 ft. 6 in., and 6 ft. The nose of the plow is built to mount curbs or other obstructions without bringing the horse or horses to a stop, and is heavy enough to stay on the walk and at the same time light enough for use with two horses.



RUSSELL ADJUSTABLE SNOW PLOW.

It is known as the Russell adjustable snow plow, and is manufactured by the Russell Grader Mfg. Co. of Minneapolis, Minn.

Company Formed to Promote National Pavement

A company, known as the Permanent Highways Corporation, has been organized to promote the "National" pavement throughout the United States.

The company is capitalized at $2,000,000 and will be headed by John K. Tener, ex-Governor of Pennsylvania, as president. The other officers are: Vice-Presidents, Frank M. Andrews and Joseph P. Fanning; Treasurer, Clayton E. Bailey.

"National" pavement, which has been described in "Good Roads," is a bituminous pavement, the patents for which are owned by the Bituminized Road Co. of Kansas City, Mo.

The Universal Portland Cement Co., of Gary, Ind., has increased its capital stock from $1,000,000 to $3,500,000.

The Dunbar Construction Co., of Dunbar, W. Va., has been formed by C. Beverly Brown, I. C. Jordon, Graham C. Painter, Connor Hall and John H. Taylor, of Charleston, W. Va.

The Asbestos Protected Metal Co. of Pittsburgh, Pa., has secured as its Georgia representative H. F. Schofield's Sons Company of Macon. The arrangement became effective on December 1.

The Walter A. Zelnicker Supply Company, of St. Louis, Mo., has recently announced the appointment of L. B. Moses, as second vice-president in charge of the rail department. Mr. Moses, who has been closely associated with the rail trade since 1903, will have his headquarters at the company's main offices in St. Louis.

The Sullivan Machinery Co., of Chicago, Ill., has recently announced the appointment of Joseph H. Brown as district sales manager at Chicago, succeeding Wm. P. J. Dinsmoor, who has resigned. Mr. Brown was formerly assistant manager of the company's New York City office. Announcement has also been made of the appointment of Wallace T. Roberts as district manager at Denver, Colo. Mr. Roberts, formerly sales engineer for the company in lower Michigan, northern Ohio and northern Indiana, succeeds Capt. Matt. R. Blish, Ordnance Dept. U. S. A., who had served as acting manager at Denver since last May. Geo. W. Blackington, who occupied the Denver position until May, is now a captain and commands the 3d Battalion, 353d Infantry, N. A., at Camp Funston, Kansas.

An eight-page folder descriptive of the "Blaw" locking cableway carriages has recently been issued by the manufacturer, the Blaw-Knox Co., of Pittsburgh, Pa. The folder, which is 3x6 in., folded, carries an illustration of the carriage, and three illustrations showing the cableway with bucket attached and in different positions. It is printed in brown and green in two colors on gray paper.

A heavy demand for motor trucks as a result of war-time demands upon the railways is predicted by General Sales Manager C. R. Norton of the Packard Motor Car Co. In speaking of the appointment of the Highways Transport Committee, Mr. Norton pointed out that the solution of the problem confronting that body lay in the use of the truck and the waterways to move the freight that the railroads cannot handle. He believes that the motor truck can take care of a great deal of it.

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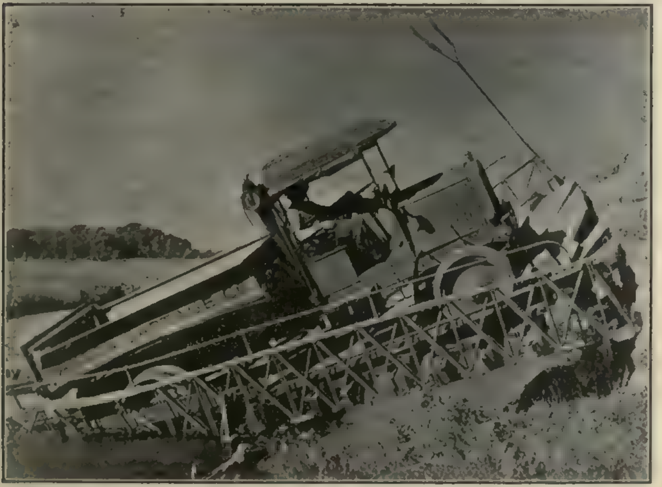
Recent Developments in Motor Truck Hauling

With the war's demands upon the producers of foodstuffs and other necessities, and upon the factories, mines and forests of the country, there has been put upon the railroads a task that has taxed them beyond their capacity. The result has been an impetus to the use of motor trucks that now seems destined to place the self-propelled vehicle in the first rank of freight carriers.

This sudden increase in the use of trucks has naturally focused attention on the roads and the urgent necessity of bringing the country's system to a condition to meet the requirements of this heavy traffic.

An idea of the character of this traffic and, incidentally, of the inadequacy of some of the existing roads and bridges of the country can be had by reference to the two illustrations on this page.



FAILURE OF A LIGHT STEEL TRUSS HIGHWAY BRIDGE UNDER A TRUCK LOADED WITH SAND.

The first shows a motor truck loaded with sand precipitated into a stream by the failure of a bridge. The structure was a 40-ft. steel span 18 ft. above the water. That the truck, a 5-ton Packard, was uninjured and, after being lowered to the bank of the stream, was driven away under its own power, does not disprove the necessity for providing bridges strong enough for the traffic they can be expected to have to carry.

In the other illustration is shown one of the trucks operated by the Goodyear Tire & Rubber Co. between Akron, Ohio, and Boston, Mass. A fleet of two White and two Packard trucks of from 1½ to 5 tons capacity are operated on a regular schedule, making the round trip of 1,510 mi. in less than a week. On the eastward trip the machines carry tires and on the return trip bring back to the plant loads of cotton fabrics and machinery.

Pneumatic tires are used exclusively, for although they are more expensive they cause less wear and tear on the trucks and on the roads, according to J. L. Sydnor of the Goodyear Company. The service was begun last April and it is planned to continue it through the winter unless there is so much ice and snow that the trucks cannot be run. Most of the roads traversed are improved, though there are about 28 mi. on which trouble with mud is frequently encountered. The poor condition of old wooden and steel bridges is also a handicap.

ONE OF THE HEAVY TRUCKS OPERATED BETWEEN AKRON, OHIO, AND BOSTON, MASS.

The illustration at the top of the first column on page 318 shows one of the fleet of trucks used in the building of the new high level bridge at Cleveland, Ohio. The machine shown—a White truck—is being loaded with marial excavated from the west subway approach. This approach, with the one on the other end of the bridge, will accommodate the street car traffic for which the lower deck of the structure will be used exclusively

Motor trucks have been used very extensively in all the work on this bridge. It is stated that 90% of all the material used in its construction has been brought to the job by trucks.

Brief mention of the use of motor trucks in building this bridge was made in a previous issue ["Motor Trucks Used in the Construction of the New Cleveland High Level

ONE OF THE FLEET OF TRUCKS USED TO HAUL MATERIALS DURING THE CONSTRUCTION OF THE NEW HIGH LEVEL BRIDGE AT CLEVELAND, OHIO.

Bridge," "Good Roads," Oct. 7, 1916, page 166]. The bridge consists of a double-decked, three-hinged steel arch, 591 ft. in length, and twelve concrete spans. Its total length is about 2,900 ft. and its total cost will be approximately $5,000,000.

One instance of the rapid development of motor truck hauling is furnished by the Beam-Fletcher Corporation of Philadelphia, Pa. This concern has operated a fleet of 22 White trucks on a regular schedule between Philadelphia and New York. Part of the fleet leaves Philadelphia at 8 p. m., arriving in New York at 6 o'clock the following morning. Another part of the fleet leaves New York at 5 p. m., and reaches Philadelphia at 3 o'clock in the morning. Trucks are also operated between Philadelphia and Washington, D. C., Baltimore, Md., Wilmington, Del., Hartford and New Haven, Conn., Springfield and Boston, Mass., Providence, R. I., Harrisburg, Reading and Bethlehem, Penn., Trenton, Newark and Jersey City, N. J., and other cities. Part of this company's fleet is shown in the illustration at the foot of page 318.

Numerous instances of single shipments or groups of shipments can be cited. Examples are the hauling of materials for making batteries from Philadelphia to New Haven, a distance of about 275 mi.; the transporting of 5 tons of Red Cross materials from Philadelphia to Boston, a distance of about 325 mi., in less than two days; and the moving of pile driving equipment 25 mi. for the Raymond Concrete Pile Co. Part of this outfit is shown in transit in one of the accompanying illustrations.

PART OF THE MOTOR TRUCK FLEET OPERATED BY THE BEAM-FLETCHER CORPORATION BETWEEN PHILADELPHIA AND NEW YORK AND OTHER CITIES.

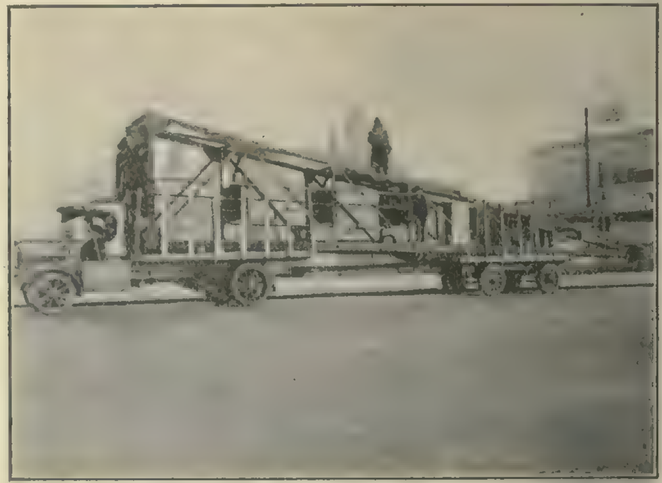
The use of trucks for troop movements is foreshadowed by the test made on the Dixie Highway. This was noted in "Good Roads" for Nov. 17.

With hauling of this character already a factor in the road building situation and bound to become more and more common, road builders must take it into account in both construction and maintenance work. Roads must be laid out, designed and built to carry what has heretofore been regarded as extraordinary or occasional traffic, for such traffic will be the ordinary traffic of tomorrow.

Road Building Plans in Colorado

It is planned to expend $1,800,000 for state highways alone in 47 of the 63 counties of Colorado in 1918, according to a recent report.

As the counties propose to furnish $700,000 of this leaving $1,100,000 to be furnished by the state, and as the half-mill state tax for highway purposes will bring in only about $800,000 in the entire 63 counties, material reductions will have to be made in the proposed expenditures in order to keep the cost of the work within the funds furnished by the levy. It has been estimated that, basing the estimate on the work proposed in the 47 counties referred to, the proposed expenditures in the entire state exceed the available funds by over $500,000.



TRUCK AND TRAILER HAULING PILE DRIVING EQUIPMENT ON GOVERNMENT WORK.

Unusual prosperity is reported in the farming counties. Last year's tax levy for county road purposes has been increased in every instance. Another indication of greater prosperity is an increased valuation of land and property. In one county, Weld, the valuation is $83,600,000 as against $76,000,000 in 1915. In Washington, Logan and Cheyenne Counties there are also greatly increased valuations.

Advances of Funds for Road Work in Utah Counties Recommended

Advances amounting to a total of $75,000 may be made to seven counties in Utah for road work.

According to recent advices, the State Roads Commission has recommended to the State Board of Loan Commissioners that advances be made as follows: Salt Lake County, $40,000; Davis County, $2,000; Cache County, $10,000; Carbon County, $5,000; Duchesne County, $5,000; Millard County, $5,000, and Boxelder County, $8,000.

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The Authorities of Lenoir County, N. C., are planning to expend several hundred thousand dollars for road improvement during 1918. The cost of improving all of the main highways of the county is estimated at from $750,000 to $1,000,000. The county's road force this winter will concentrate its efforts on the maintenance of existing highways.

Present Conditions Affecting Road Construction, and Measures Taken to Meet Them, in the Central West*

By S. E. Bradt†

Geographically speaking, I do not know where I am at. The Central West may be located anywhere between the Alleghenies on the east and the Rockies on the west, depending upon the viewpoint; and yet the uncertainties of my geographical position are simple as compared with the uncertainties which confront road construction at the present time.

Each section, East, Central West, South and Far West, has its own problems of climate, soil, available material and topography, but these problems are, however, largely secondary to the broader problems which confront us all at this time. Some of these broader problems affecting road improvement are scarcity of labor, high cost of labor and material, depletion of engineering forces, shortage of cars, priority orders. These problems arise from conditions over which we have no control and which we shall not be able to overcome to any great extent while the war lasts.

We are coming to measure every enterprise by the one standard: Will it help to win the war? The farmer is called upon to produce to the utmost and to that end is assisted by the Government; the lumberman, to the extent that he is furnishing material for ships or Government buildings and similar work, is not interfered with; the manufacturer whose product is in any way allied to the war industry is called upon to produce to the limit—if his plant is not capable of producing material that will come up to this standard he will be informed that cars will not be furnished to move the raw material which he uses, and that the labor which he employs will be required in other lines of endeavor.

We, as loyal citizens, must face the same inquiry, and this enterprise which we represent must be measured by the same standard: Will it help to win the war? Nearly the entire product of our farms, much of the product of our forests and some proportion of the product of our factories are hauled over our highways. It is, therefore, apparent that the condition of these highways enters not only into the cost of these commodities, but also into the facility with which they are distributed. At the present time, owing to the urgent demands of the war, we are to some extent ignoring the matter of cost of transportation, but are laying great stress upon the facility with which it is carried on. Not only that, but because of the congestion of railway traffic, our highways are now called upon to carry a much greater proportion of the factory product and in consequence the improvement of our highway is a more important factor than ever before and has a direct bearing upon the rapidity with which the products of the farm and factory are carried to the front. We do not hesitate to say, therefore, that the improvement of our highways is an important factor in winning the war. The pity is that our people have not heretofore appreciated the importance of highway development and what it means to the country in such a stress as this.

We, as road builders, know, however, that road building under normal conditions is a slow process and that under existing conditions, with high prices of labor and material, shortage of engineers and cars, it would be impossible to make any impression upon those country highways leading back to the farm in time to be of any assistance in this emergency. In fact, the farmer has always succeeded in marketing his crop, not as cheaply as he could have done it over good roads and not always as quickly, but nevertheless, it has always reached the market sooner or later, and under the spur of present conditions he will continue to take care of that problem. All of this leads me to the conclusion that it is now too late to give attention to the purely country roads, and that while they are importan in helping to win the war their relative importance is not such as will warrant taking labor and cars from other industries under these conditions.

There is a class of roads, however, that can be improved in time to render valuable service in this emergency, and they are of such relative importance in this crisis as to warrant the releasing of cars and men for their improvement. I refer to the main highways connecting our important manufacturing centers with each other and with the water shipping points. These highways will assist materially in carrying our products—mainly factory products—and thus relieve the railway congestion which we are now facing.

To determine which roads come under this classification is an important matter. It cannot always be left to the local authorities.

I am hoping that the duty of assisting in determining these roads for the improvement of which cars may be released has been made a part of the work of the committee on motor truck transportation, of which Mr. Page and Mr. Shirley are members. If not, another committee should be named with authority to release cars: First, for the maintenance of our present system of improved highways; second, for the completion, so far as may be, of unfinished contracts on unfinished roads; and third, per the construction and improvement of these main traffic roads to which I have previously referred. I hope that this organization will support the naming of such a committee unless this duty has already been conferred upon the Highways Transport Committee.

We had laid out rather a pretentious program for the State of Illinois to be carried out during the year 1918. In addition to the regular state aid money of $2,000,000, we were preparing to spend not less than $5,000,000 of federal, state and county bond issue money in improving some 300 mi. of connected main highways. The money is ready, the surveys are being made; how much, if any, of this 300 mi. we shall be able to construct is an uncertainty. However, we shall be prepared to do all or such proportion of this work as may best serve the needs of Illinois and the country at large.

While we may not be able to carry on our usual work, we can at least lay our plans for the future, and that is what we in Illinois are trying to do. If the economists are correct in their judgment, then there will follow at the close of this war a period of depression, when work will be scarce, when men will be unemployed and prices low. It is for us to look ahead and be ready to lend our assistance at that time. If this war lasts another year, it is likely that from 1,000,000 to 2,000,000 of our citizens will be in France, another 1,000,000 to 2,000,000 of our citizens will be in the various training camps at home, hundreds of thousands will be employed in factories supplying the munitions of war for the men at the front. Thousands will be engaged in building ships and aeroplanes. When this war ceases, which we hope may be soon, these men will be out of a job.

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*Paper presented at the annual meeting of the American Association of State Highway Officials, Richmond, Va., Dec. 4-6, 1917.

†Superintendent of Highways, Illinois Department of Works and Buildings.

We shall have adjusted our commercial life so as to get along without them. We cannot immediately put them back into the places from which they came. It will, therefore be of great value to this country if our states shall arrange for funds to be ready to employ large numbers of these men in public improvements. With this end in view, we in Illinois are doubling our efforts to carry at the coming November election the $60,000,000 bond issue for highway improvement, which was authorized at the last session of the Illinois Legislature. If we are successful it will not only prove to be a great benefit to the citizens of our state in furnishing employment at the close of the war, but in addition, we shall be able to build more miles of road for the money than we can build now.

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Road Legislation at the 1917 Session of the Pennsylvania Legislature

Road measures enacted by the 1917 session of the Pennsylvania Legislature include the law giving the commonwealth's assent to the federal aid plan of constructing rural post roads; a joint resolution proposing an amendment to the state constitution, authorizing the issuance of a $50,000,000 bond issue, to be used for road building and maintenance; a law providing for prison labor on state highways and state aid highways and the law specifically appropriating to the State Highway Department for use on state highways and state aid highways all moneys derived from the registration and licensing of motor vehicles.

At the close of business on Nov. 30, 1917, these funds amounted to $3,265,039.50.

Appropriations to the State Highway Department for the biennial period from June 1, 1917, to June 1, 1919, were as follows: For state highway construction, $6,000,000; for state aid highway construction, $1,500,000; for the acquisition of toll roads, forming a portion of a state highway route, $560,000; and $1,873,470.40 for the payment of the commonwealth's share of the deficiency due to the second-class townships, caused during the years 1910, 1911 and 1912, in carrying out the laws of the state relative to the construction, maintenance and repair of roads in the various townships. Over this latter appropriation the State Highway Department exercises only advisory control, through its Bureau of Township Highways.

An important enactment is that making funds appropriated for state highways and state aid highways available for the construction or improvement of state highways constructed in the same manner as state aid highways. This act was approved March 20, 1917, and is an amendment to the act approved June 5, 1913, which was a supplement to the Sproul Act of May 31, 1911. The amendment follows:

> Section 1. Be it enacted, etc., that the state highway commissioner is hereby authorized to make and enter into contracts for the reconstruction or improvement of any section of a state highway for which an application has been, or which may hereafter be, made, by any county, township, borough, or incorporated town, or by any county and township, county and borough, or county and incorporated town, asking that such section of state highway be reconstructed or improved in the same manner as a state aid highway, and agreeing to pay its or their respective share of the total cost of said reconstruction or improvement as provided for in Sect. 33 of the act to which this is a supplement, or upon such other terms and conditions as to the sharing of the total cost of said reconstruction or improvement as may be agreed upon between the state highway commissioner and any such county, township, borough, or incorporated town, or between the state highway commissioner and any such county and township, county and borough, or county and incorporated town, but otherwise, as provided in Sect. 33 of the act to which this is a supplement.
>
> In the construction or improvement of any such state highway in any borough, town, or township, in the same manner as a state aid highway, the State Highway Department may use funds now appropriated, or that may hereafter be appropriated, either for state highway or state aid highway purposes.

By the provisions of the act approved May 17, 1917, counties, townships, boroughs, or incorporated towns, are authorized to enter into contracts with the State Highway Department for the reconstruction or improvement of any state highway, or portion thereof, in the same manner as a state aid highway, and they are also authorized to incur indebtedness to pay their respective shares of the cost. This work must be done under contract, as provided for in the act of May 31, 1911, and the road so improved or reconstructed shall remain a state highway.

Any county in Pennsylvania may appropriate and expend money for the improvement and maintenance of state highways, state aid highways, or any public highway, within its limits. However, before any improvement may be made to a state highway or state aid highway, permission must be secured from the State Highway Department. This act was approved March 22, 1917.

Section 10 of the Sproul Act, approved May 31, 1911, was amended so that state highways can be constructed in boroughs in the same manner as in townships. The appropriation, however, follows the language of the former law and the funds available "must be used only in building unimproved sections in boroughs, where the state highway is improved up to each end of the borough."

Damages resulting to abutting property caused by a change in existing lines or location in the construction, reconstruction, or improvement of state highways must be paid by counties having a population of less than 800,000 inhabitants, by the provisions of the act approved July 18, 1917, provided that, in all such cases, the state highway commissioner first notifies the county commissioners of the proper county, in writing, of the contemplated change in such existing lines and location; in turn, the county commissioners, if possible, enter into an agreement with the owner or owners of such abutting property as to the amount of damages to be paid, whereupon the county pays the same.

In case a satisfactory agreement can not be made between the property owners and the county commissioners, the state highway commissioner is authorized to proceed with the proposed construction, reconstruction, or improvement, and the owners of the damaged property then may present a petition to the court of quarter sessions for damages. "The proceedings upon said petition, and by the viewers, shall be governed by existing laws relating to the ascertainment and assessment of damages for laying out and opening public highways; and such damages, when ascertained, shall be paid by the county in which the state highway is located."

The state highway commissioner may take over, in his discretion, abandoned rights of way of canals and railroads, that have not been used, occupied or built upon for a period of two years, for the purpose of locating a state highway. This act, which was aproved July 11, 1917, provides that the state highway commissioner, for and in behalf of the commonwealth, shall purchase such rights-of-way, or such portion thereof, as may be necessary for the locating of said state highway.

(*Continued on page 324*)

One Year's Experience in the Federal Aid Road Law*

By Logan Waller Page.†

When President Wilson signed the Federal Aid Road Act on July 11, 1916, he rendered effective a measure unique in the annals of American legislation. It involved not merely the granting of financial assistance to the states in the building of their public roads; it went much further and placed on trial a far-reaching policy of cooperation between the Federal Government and each of the 48 states. It undertook to lay down the conditions which should govern the cooperation and it specifically called for affirmative legislation by 48 other legislative bodies than the Congress of the United States. It placed the administration of the act in the hands of 49 agencies comprising the Secretary of Agriculture of the United States and the highway department of each of the states. On the one hand, therefore, we have the manifold difficulties incident to the adjustment and smooth operation of a plan which requires action by so many different agencies, and on the other hand we have all the possibilities for good incident to the powerful cumulative effort which may thus be put forth by all of the forces of the nation working in unison.

I need not remind you, gentlemen, that only by broad and generous minded dealing with each other can we accomplish the great work cut out for us by the Federal Aid Road Act. Only by a disposition on the part of state and federal officers to overlook the small troubles and difficulties which arise, and to consider whether the plan is working out in a fundamental sense, can a true perspective of the practical results be obtained. I can assure you, gentlemen, that the federal officials are endeavoring to put themselves in your places, and to act as though they were representing the interests of each state in its turn. If you will likewise put yourself in their places and consider your problems from the standpoint of the nation we shall then have placed ourselves in that frame of mind which will best insure a friendly cooperation.

First, let me call your attention to the fact that the beneficent results of the federal aid legislation are not to be measured merely in the miles of improved roads built with the aid of federal funds. I would put that result as secondary. The most important has already been accomplished in the form of an immense amount of constructive state legislation, establishing and strengthening state highway departments, providing skilled supervision, systematizing road work in the states, establishing maintenance funds and in many other ways insuring the efficient and economical handling of the nation's road problems. I need not go into detail to convince you not only that these results have been accomplished, but that the Federal Aid Act has been a powerful factor in their accomplishment. I venture to say that three-fourths of the state highway officials within the sound of my voice have personal knowledge that these statements are correct.

Turning now from the influence of the federal act upon state legislation, I will deal briefly with what has been done by the Federal Government in the administration of the act. A great many people had the impression that within a few weeks after the measure was placed on the statute books money would begin flowing into the states and the building of federal aid roads begun. At the risk of burdening you with details with which most of you are already familiar, I shall set forth some of the preliminary work which the act specifically required before road building could be undertaken: First, it was necessary that the Secretary of Agriculture certify to the Secretary of the Treasury and to the state highway departments the amounts apportioned to each state, and to do this necessitated obtaining from the Postmaster General the mileage of rural delivery and star routes comprising one of the factors of apportionment. Next it was incumbent upon the Secretary of Agriculture to formulate rules and regulations for carrying out the act. This was no small task, as it was desirable to obtain the views of the various state highway officials, as well as to apply to it the knowledge and labor of the federal officials. As the act called for cooperation between the Secretary of Agriculture and state highway departments, it became necessary to ascertain by an exhaustive examination of state laws what states were equipped with highway departments within the meaning of the federal act. This task required time and an immense amount of careful and painstaking investigation.

As a result of the examination it was found that there were eleven states which were without highway departments in the sense contemplated by the federal aid act, and that the highway departments of five other states might be considered as in the doubtful class. You are sufficiently familiar with the federal act to know that it required as a preliminary to cooperation an assent by each of the state legislatures and that it made certain specific requirements, such, for example, as, that the work should be done under the direct supervision of state highway departments, that funds should be provided by or on behalf of the state, and that adequate maintenance provision should be made. Few of the states were in position when the federal act was passed to begin immediate cooperation. The legislatures of most of them met last winter, and it was not until their adjournment in the spring of 1917 that the way had been cleared sufficiently to enable individual projects to be taken up.

While the states were qualifying for cooperation, the Office of Public Roads was working out a procedure and establishing an organization. District offices were established and the Washington office was reorganized to take care of the new work. I will not go into detail in explaining to you our organization as you are familiar with it, and maps and charts setting it forth in detail have been distributed through the various districts. The procedure calls for the submission of a project statement to the office through our district engineer, followed by the submission of plans, specifications and estimates through the same channel, and for their approval by a certificate of the secretary; for the execution of a project agreement by the state highway department and the Secretary; and finally the payment of federal funds to the depository named by the state, such payments being made on a voucher submitted by the state, certified by the district engineer and approved by the department. The forms which we use and the procedure which we are following are already well known to you.

You are no doubt more concerned with the specific difficulties which you have encountered in the operation of the federal act than with any narrative which I might set forth. Touching briefly upon these it has been made clear that foremost of all the difficult questions that have arisen is that of determination of what constitutes a rural post road within the meaning of the act.

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*Paper presented at the annual meeting of the American Association of State Highway Officials, Richmond, Va., Dec. 4-6, 1917.

†Director, Office of Public Roads and Rural Engineering, U. S. Department of Agriculture.

Post Road Requirements

As to the post road requirements, I may say that almost as soon as the measure became effective widely varying interpretations of the term "rural post road" were current. It was claimed by some that it meant only those roads on which the mails were actually carried; by others, that it meant any road over which it was physically possible to carry the mails, and by still others that it meant any road on which the mails were actually carried or on which there was a prospect that they soon would be carried. Manifestly, the question was one purely legal in character, and the act could be interpreted authoritatively only by the qualified legal officers of the Federal Government. As you well know, we went to the Attorney General of the United States with our troubles and we asked him to advise us as to the eligibility of certain classes of roads which had been submitted. These classes were: (1) where the mails were actually carried over the road; (2) where the mails were not carried, but where there existed a reasonable prospect that they would be carried within a reasonable time after the completion of the road; (3) where the proposed road was an entirely new location, but there existed a reasonable prospect that mail would be carried within a reasonable time after the completion of the road; (4) where the part or parts of a project on which no mails were carried constituted an unsubstantial portion of the whole and it would be uneconomical to build the parts on which the mails were carried without building the other parts even though no prospect existed that these unsubstantial parts were ever to be used for carrying the mails. The Attorney General decided that all roads in those four classes were eligible as post roads.

Even then our difficulties were not at an end for the questions arose as to what constituted a "reasonable prospect" and an "unsubstantial part of the whole." Finally we drew up with the aid of the solicitor of the department as detailed instructions as we felt the regulations and the opinions of the Attorney General would permit for the use of our district engineers. Merely as a guide and not as a rule, we advised that: (1) where the unused portion of a project was comprised in several or a number of short sections, concerning which no prospect of their use by mail routes existed, the project might be worthy of approval if these short unused sections did not aggregate more than approximately 30%; (2) that where the entire project was inconsiderable as to mileage, the parts not used and concerning which no prospect could be shown might aggregate as much as 30%; (3) that where the unused portion consisted of one or two parts not on the end of the project they might aggregate approximately 20% of the entire project; (4) that where the unused portion consisted of one part at each end of the project and connected with a small town or city or an improved road or another post route, such portion might comprise approximately 20% of the entire project; (5) that where the unused portion concerning which no prospect existed comprised a stretch at one end of the project connecting with a large city, it might comprise approximately 10% of the total length of the project.

In other words, gentlemen, we have tried in every way possible to find ways and means for making the post road provision of the federal act as reasonable as possible within the law. You can hardly blame us if we have had to do this in some measure step by step. The Attorney General and other law officers of the Federal Government do not deal with purely hypothetical questions, and it is necessary, therefore, that we submit to them genuine cases so that they may see the actual troubles which we are trying to remedy.

I am gratified to be able to say, however, that with all of its troubles the post road provision has served to disqualify a very small percentage of the projects submitted. This is proven by the fact that out of a total number of projects submitted by the state highway departments to Nov. 30, 1917, inclusive, of 228 there have been approved 168, and only 6 have been disapproved. You can see, therefore, that the trouble is not so serious as a casual consideration might make it appear.

Compliance with State Laws

Questions have arisen in connection with state laws which have been productive of some delay and I have heard the contention that the Federal Government should take it for granted that the respective state highway departments are complying with the laws of their states, and we should, therefore, hold the state highway departments only to a compliance with the provisions of the federal act. This contention is sound except in so far as the federal act itself calls for certain conditions to be met in certain ways by the states. I have already mentioned the fact that the federal act permits cooperation only with the state highway departments. Now it is necessary, not only that the Secretary of Agriculture determine whether or not a state has a highway department, but who and what constitutes the department, and he must assure himself that he is dealing with those persons comprising the highway department and no others. If, therefore, a state law prescribes that certain officials, organizations, or individuals shall have certain duties and authority in connection with the regular personnel of the recognized highway department, the Federal Government must deal with them according to the provisions of the state law.

I have already mentioned to you that the work must be done under the direct supervision of the state highway department. It follows that the Federal Government cannot deal with the state highway department as to something over which that department has no jurisdiction. It is a simple and reasonable requirement, therefore, that the state highway department assure the secretary that it has the supervision contemplated by the federal act. It is no less a duty of the federal officials to ascertain how the funds are to be provided by or on behalf of the state and that the depository is authorized as required by the act to receive state and county funds. This matter has received the most careful study by the Secretary of Agriculture and I am glad to say that henceforth we shall be able to simplify the steps by which these requirements may be met.

We have had much trouble in the matter of obtaining plans, specifications, and estimates promptly following the approval of the project statements so as to enable the agreements between the Secretary of Agriculture and the state highway departments to be executed without delay. We have had inquiries from time to time from interested parties urging the Government to allow the work to proceed without further delay, when as a matter of fact we were as anxious as the inquirer to have the work start, but we could not authorize the commencement of construction until plans, specifications and estimates had been submitted to and approved by the secretary as required by the act. I think our requirements are reasonable as to plans, specifications and estimates, and if they are reasonable, certainly there should be no difficulty on the part of the states in supplying the information which we seek. If any of our requirements in this connection are unnecessarily burdensome upon the states, I trust they will be freely and frankly brought to our attention. Our chief engineer, his assistant, and our ten district engineers are all here ready

(Continued on page 326)

GOOD ROADS

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

December 22, 1917

MOTOR TRUCKS FOR LONG HAULS

For some time it has been evident that the motor truck would take over much of the short-haul business of the railroads. Since the United States took a hand in the Great War, it has become apparent that the truck will also develop into a considerable factor in long distance transportation.

The growth of motor truck hauling has been rapid, and it has been only natural that its use to bring loads to railroad shipping points should lead to its use for short hauls between points connected by rail and then to its employment for long hauls. In the case of the shipment of farm products, for instance, it frequently was found to be as cheap to use a truck for the entire distance from producer to seller as it was to haul to the railroad by truck, transfer to freight cars for shipment to market and then transfer again and complete the haul by truck or team. In addition, it was very often possible to save time and to deliver the produce in better condition. As improvements were made in trucks, the economical hauling distance became greater and greater and the cost less and less.

With the war's demands upon the railroads, the employment of the motor truck became a matter of necessity in many instances. Freight embargoes, priority orders and car shortages made it impossible to ship by rail, leaving the producer no alternative but the use of motor trucks if he wished to reach a market. Thus, in a way, the long haul was forced upon the truck—and the truck is making good.

Indications of the extent to which the motor truck is meeting transportation demands are contained in an article on other pages of this issue, in which are cited typical instances of both long and short hauls by trucks. Probably the most striking demonstration of the motor truck's adaptability and dependability is the run from Detroit to the Atlantic coast that is being made at this writing.

These things mean a great deal to shippers; they are of much importance to the general public. But they have a special significance for road builders. Trucks are useless without roads—as useless as locomotives and freight cars without tracks. And while some of the more powerful machines can make their way through sand or mud or snow, over rough or stony places, or across ditches or washouts, their efficiency is increased by good roads and decreased to almost zero by bad ones. The automobile—the so-called pleasure car—and the motor truck have already given road improvement a great impetus, but only improved roads can bring out all the possibilities of the truck as a common carrier.

Not long ago road builders had to build for only horse-drawn traffic. Then it became necessary to put down surfaces that would withstand swift but comparatively light self-propelled vehicles. Now foundations and wearing surfaces must carry horse-drawn vehicles, swift, light pleasure cars and slow, ponderous trucks. And a roadway that will support an occasional heavy load will not do; roads must be built to bear heavily loaded vehicles as ordinary traffic.

Another thing must be taken into account by road builders. There are not enough men, money and time to put down surfaces of this kind on all of the more than two million miles of public highway in the country in the near future. Though most of this enormous mileage needs improvement, there is a certain portion that must be given the preference both in time and manner of improvement. This latter mileage must be taken care of first, partly as a war measure and partly as one of the chief factors in the building up of the nation's commerce and industry. The selection of this mileage is a matter of engineering—military engineering to a certain extent. It must be done through the joint efforts of the highway and military authorities.

The road system of the country, with the motor truck, must solve the present transportation difficulties. The efficiency of the truck's use depends very largely upon the road builders of the country and they have an unusual opportunity for patriotic service hardly second to service at the front.

A YEAR OF FEDERAL AID

What has been accomplished in a year's operation under the federal aid law is summarized elsewhere in this issue in an interesting paper presented at the recent meeting of the American Association of State Highway Officials by Logan Waller Page, Director of the Office of Public Roads and Rural Engineering.

Partly on account of the relatively short time the law has been in effect and partly because of the difficulties attending road work of all sorts during the past season, most of the work done so far necessarily has been of a preliminary nature. It is, therefore, too early to arrive at definite conclusions as to the workability of the law or its ultimate effects upon road work throughout the country; another year at least will be necessary to reach conclusions of much value.

At the same time it even now seems apparent that work will proceed smoothly on the whole. Federal participation in highway work still must be regarded as of an experimental nature and difficulties in the administration of the law must be expected. Moreover, there could hardly have been a more unfavorable time for making such an experiment, because all road work has been so greatly handicapped by the conditions arising from the war.

Already there has been one very beneficial result of the law. That is the establishment of a responsible central road authority in every state. One of the wisest provisions in the act was the one making the establishment of such an authority a prerequisite to participation in federal aid.

Road Legislation at the 1917 Session of the Pennsylvania Legislature

(Continued from page 320)

An important enactment was that which enables counties, townships, boroughs, or incorporated towns, to join with the State Highway Department in freeing toll roads which form a portion of a state highway route, each contributing such part of the cost as may be mutually agreed upon.

No new routes were added to the system of state highways but acts were passed permitting changes in 28, most of them at the instance of the State Highway Department, in order to eliminate grade crossings and to secure better grades. Nine grade crossings will be eliminated by the change in State Highway Route 105, running from Emporium to Lock Haven, and this change will also permit of the opening of a road from Lock Haven to Renovo. It is estimated that the cost will be from $500,000 to $600,000 less than if the road were held in its present location.

Eleven and a half miles of dangerous road will be eliminated by the change provided for Route 266, running from Coudersport to Williamsport; and two grade crossings will be eliminated by the change in Route 28, running from Middleburg to Lewistown.

A change in Route 224, running from McConnellsburg to the Maryland state line, provides for a spur from Foltz to the Buchanan Birthplace Monument; thence to Charleston, Mercersburg and Greencastle, to Waynesboro and thence over Route 44 to the Maryland state line.

The change in Route 63, running from Indiana to Brookville, is a good one, as it combines two parallel routes, while that on Route 10 was recommended because of better construction conditions.

The change in Route 268, from Greensburg to Waynesburg, via Route 118 to Charleroi, thence by way of Allenport, California, West Brownsville, and Millsboro, to a point near the western boundary of Rice's Landing Borough. to cross roads near Dry Tavern, thence by way of Stockdale's Lane to Jefferson, Greene County, is considered a good one on account of shipping facilities and better grades.

The change in Route 275, running from New Bloomfield to Middleburg, was advocated by the William Penn Highway Association and is as follows:

> Commencing in New Bloomfield, and running over Route 30 to Duncannon; thence over Route 195, to Amity Hall; thence along the east side of the Juniata River to a point opposite Newport on Route 31; thence over Route 31 to Thompsontown; thence by New Salem and Cocolamus to a point near Swales; thence over Routes 194 and 195 into Middleburg, Snyder County.

On Routes 20 and 212 changes were made in order to lay down the Susquehanna Trail from Troy to the New York state line. These changes were not recommended by the State Highway Department.

All persons contracting with the commonwealth of Pennsylvania, or any department or officer thereof, or any municipal corporation, division or subdivision of the commonwealth, are required to accept the provisions of the Workingmen's Compensation Act of 1915, together with any supplements or amendments thereto which may hereafter be passed, according to the terms of the act, which was approved July 18, 1917 (P. L. 1083). A contractor is also obliged to insure his liability thereunder, or file with the commonwealth, or the municipal corporation or board with whom the contract is made, a certificate of exemption from insurance from the Bureau of Workingmen's Compensation of the Department of Labor and Industry. The provisions of this act are applicable to all contracts which involve the construction or doing of any work involving the employment of labor.

The use of prison labor on state highways and state aid highways is authorized by the act approved July 11, 1917, which provides that, when there is a scarcity of labor in the commonwealth, the state highway commissioner, if he deems it advisable and if the governor so approves, may call upon the wardens or sheriffs of the several county prisons, the wardens of the penitentiaries, and the superintendents of reformatories or reform schools, maintained by the commonwealth or receiving appropriations therefrom, for a certified list of the names of such prisoners or inmates, who could be, in the opinion of such penal officers advantageously employed in the construction, reconstruction, or maintenance of state highways and state aid roads. In this connection, however, it may be noted that the law specifically relating to the construction of state highways and state aid roads requires that all construction work be done by contract, awards to be made to the lowest responsible bidder, after advertisement.

All additional expenses incurred by the various institutions by reason of services rendered must be paid by the State Highway Department, while the prisoners, themselves, when employed in road work, must be paid not less than 40 ct. nor more than 60 ct. a day.

The enactment of the township code is of great importance to the hundreds of townships in the state, although no material change was made in existing laws. However, those laws which had been superseded were specifically repealed and, in the codification, an effort was made to eliminate all provisions that were not operative and to consolidate provisions of the same tenor in laws which were enacted separately. The passage of the township code made it necessary to reenact the law which provides for a Bureau of Township Highways in the State Highway Department, but no changes were made in the functions of this bureau.

No changes were made in the Pennsylvania Motor Vehicle Law. A number of measures were introduced with a view of bringing about some needed changes, but all failed of final passage.

A law was passed which prohibits intoxicated persons from handling or driving horses, or other animals, or teams or vehicles, on the highways of the commonwealth. Another law was passed limiting the speed of power-driven vehicles on or over public bridges of the state to 6 mi. an hour.

Another act requires drivers and operators of any motorcycle or automobile, or other vehicle, in case of collision on the public highway, to stop and return to the place of the accident and to render such aid and assistance to the person injured as may be necessary.

In Hartford, Conn., efforts are being made to complete the city's paving program for the fiscal year by Jan. 1. The cement concrete paving work has been completed for several weeks, but there is a certain amount of other work still unfinished.

The Highway Between Buffalo and Clarence, N. Y., will be kept clear of snow this winter by the Automobile Club of Buffalo, according to report. For several years the club has been urging that this work be done throughout the state, by the State Highway Department. The plans for the local work include the use of a snow plow attached to a motor truck and experiments with a snow roller, the latter being made to ascertain whether this or the plow will give the better results.

Mississippi has $7,500,000 Now Available for Highway Work, according to a recent statement by State Highway Engineer X. A. Kramer. A considerable amount of work is being held up in the state because of the inability to obtain cars for the shipment of gravel, one estimate placing the total value of this work at nearly $5,000,000. Work is being pushed, however, in those counties where gravel pits are near enough the work to permit hauling by teams. According to reports from the state, it is hoped that by spring it will be possible to obtain railroad cars for the shipment of road materials.

Woman Drags Roads in Lincoln County, Minnesota

The tendency to replace men by women has extended to highway work, according to a recent report from Minnesota. A district engineer of the State Highway Department was impressed with the splendid condition of a state highway which he inspected last summer, and upon inquiring who was responsible for the dragging and maintenance of the road was told that a woman was the dragging contractor for that stretch of highway.

County Engineer Elmer Keller, in whose territory the road was situated, made the following statement relative to the woman contractor and her work:

"She is Miss Anna McCartney of Ivanhoe, and I defy you to pick anyone in the state who does better work. She has been the dragging contractor for the north 6 miles of Road No. 9 in Lincoln County for two years. During that time, she has done all the work herself and everyone who has been over the road concedes that her section has had the best care of any state road in Lincoln County. Her promptitude in getting out soon after a rain and the interest she takes in getting the road into good shape as soon as possible should be commended, and if her methods were followed by other draggers, less trouble would be experienced by officials having charge of the maintenance of state roads."

Army Truck Train from Detroit to the Atlantic Coast

A military truck train started from Detroit, Mich., on Dec. 14, on a trip to the Atlantic coast intended to test the practicability of bringing overland under their own power trucks consigned for war service in Europe. The test is also to serve as an index of the feasibility of long distance transportation of supplies by motor truck.

One of the accompanying illustrations shows the train en route, and the other shows one of the machines with members of the detachment accompanying the train.

GROUP OF OFFICERS AND ENLISTED MEN WITH ONE OF THE UNITS OF THE TRUCK TRAIN MAKING A RUN FROM DEROIT TO THE ATLANTIC COAST.

The train consists of 30 Packard 3-ton trucks and is in command of Capt. Bennett Bronson and Lieut. C. A. Riley. The remainder of the force consists of two officers and 78 enlisted men. The drivers are all men from the Quartermaster's Department of the army, ordered to duty from Camp Sherman, Chillichothe, Ohio, and from Marfa, Texas. The men are quartered at night in various armories along the route.

The train is designated as Division Supply Train No. 308, Truck Company No. 2. The trucks are equipped with bodies built according to the specifications of the Quartermaster's Department. One of them is a kitchen truck carrying food and supplies for the crews, and two are fitted with tanks for carrying gasoline for the trip.

The route extends from Detroit, Mich., through Toledo, Cleveland and Ravenna, Ohio, to Pittsburgh, Pa., and thence over the Lincoln Highway to Philadelphia and thence to the port.

TRAIN OF PACKARD 3-TON TRUCKS EN ROUTE FROM DETROIT, MICH., TO AN ATLANTIC PORT IN A TEST OF OVERLAND TRUCK TRANSPORTATION.

One Year's Experience in the Federal Aid Road Law

(Continued from page 322)

to discuss these questions and to have the benefit of any advice or suggestions that you may have to offer. Incidentally I may say that of 168 projects approved only 88 sets of plans and specifications have been submitted. Of this latter number 72 have been passed by our engineers and recommended for approval, so that only 16 sets of plans and specifications submitted are now pending

I shall not go further into detail as your program has a number of headings for discussion and I judge that a discussion under those specific headings will be more enlightening than a presentation in a general paper. You may be interested, however, in knowing the status as to individual projects as of this date. I have had prepared a table showing by states the number of projects submitted, the number approved, the number covered by project agreements, the amounts of state and federal funds involved in the projects. The balances remaining of the allotments to the respective states may therefore easily be ascertained. I would call your attention to the grand totals showing that 228 projects have been submitted, 168 approved, and 6 disapproved. The amount of federal aid involved in the projects submitted is $5,664,442.31, the total including state and local funds $13,583,577.98 and that the total approved is $4,052,142.85 federal funds and $9,770,179.40 federal, state and local funds. In this connection I would call your attention to the fact that those states which had highway departments at the time the apportionment was made for the fiscal year ending June 30, 1917, must enter into project agreements on or before June 30, 1918, or the amount allotted to them and not covered by project agreement will be apportioned under the terms of the act to all of the states. I would suggest that you examine into this question very closely as a comparatively short time exists for you to save this first year's apportionment to your state.

In conclusion I desire to express my deep appreciation of the cordial spirit of cooperation which you have individually and collectively shown toward the representatives of the Department of Agricultural who are charged with the administration of the Federal Aid Road Act. For the most part you have been patient in the face of delays, which however unavoidable, were exasperating, and you have endeavored earnestly and conscientiously to meet all the requirements of the Federal Government. I assure you that we shall reciprocate in every way possible and I predict that before long our difficulties will all be smoothed out and we shall be reaping the full benefit of this great cooperative measure.

TABLE II—PROJECTS APPROVED AND PROJECT AGREEMENTS EXECUTED BY SECRETARY, DEC. 1-4, INCLUSIVE.

States.	Number Projects Approved.	Federal Funds Involved.	Total Funds Involved.	No Miles in Approved Projects.	No. Project Agreements.
Iowa	2	$44,672.10	$113,400.10	21.50	..
Kentucky...	1	55,640.12	111,280.24	9.96	..
Maine	1	123,134.11	246,268.23	12.88	..
Mississippi..	1	10,000.00	36,784.00	10.7	..
New Mexico.	4	112,667.18	225,334.36	54.00	..
Ohio	..	307,780.00	1,062,380.28	30.803	5
Pennsylvania	3	154,400.00	580,356.20	15.44	..
Texas	3	69,439.30	139,267.70	32.40	..
	15	$877,732.81	$2,515,071.11	187.683	5

TABLE I—STATUS OF FEDERAL AID PROJECTS BY STATES AS OF NOV. 30, 1917.

State.	Number Projects Submitted.	Federal Funds Involved.	Total Funds Involved.	No. Projects Approved.	Federal Funds Involved.	Total Funds Involved.	No. Miles in Approved Projects.	No. Projects Agreements.	No. Plans, Spec., Estimates Submitted.
Alabama ...	28	$286,834.88	$585,739.46	22	$235,012.91	$482,022.22	145.857	8	15
Arizona	1	557,899.89	115,799.79	1	57,899.89	115,799.79	(bridge)	1	1
Arkansas	8	105,603.72	260,127.43	7	102,434.71	251,255.37	33.035	7	7
California	5	142,667.36	252,698.39	2	60,827.20	125,378.06	6.785	2	2
Colorado ..	7	122,477.91	244,955.83	3	100,982.20	215,426.33	80.51	..	1
Connecticut	2 (a)	78,400.00	217,969.29	2	78,400.00	217,969.29	7.8	1	1
Florida	2	32,500.00	92,220.60	2	32,500.00	92,220.60	14.43	..	1
Georgia	3	167,798.93	336,545.84	3	167,798.93	336,545.84	124.03	..	..
Idaho	1	75,000.00	190,410.00	1	75,000.00	190,410.00	57.0	..	..
Iowa	8	184,002.45	616,912.48	4	82,512.60	251,760.88	52.07	1	1
Kentucky	2	117,393.82	242,821.65	1	67,593.82	135,187.65	8.13	..	..
Louisiana	7	166,361.31	500,053.86	5	140,924.02	410,197.49	77.48	..	4
Maine	3 (a)	281,194.64	582,091.17	2	158,063.53	335,822.94	15.53	1	1
Maryland	4	93,050.21	202,436.98	4	93,050.21	202,486.98	9.68	3	4
Massachusetts .	6	114,390.36	257,252.74	6	114,390.36	257,353.74	12.435	3	5
Michigan	7	380,261.39	760,522.25	5	293,419.75	586,839.50	83.945	1	3
Minnesota	14	380,840.52	798,919.38	13	265,840.52	753,919.36	252.01	2	5
Mississippi ..	7	106,381.80	257,117.46	5	85,164.28	197,311.46	77.0	..	..
Missouri	3	62,356.33	250,225.34	3	62,556.33	250,225.34	39.7	..	..
Nebraska	2	52,446.90	273,881.85	1	17,847.50	204,683.05	5.5	..	..
Nevada	4	98,203.96	196,405.92	..	....	....	....	..	..
New Hampshire	8	58,668.91	117,337.84	3	58,668.91	117,337.84	13.24	3	6
New Jersey	1	59,212.68	184,988.01	1	59,212.68	164,998.01	9.7	..	..
New Mexico	11	307,756.37	615,507.75	1	5,287.99	10,575.99	3.0	..	..
New York	5	295,780.55	591,562.10	4	227,843.55	455,687.10	22.87	..	..
North Carolina	14	108,500.00	380,662.51	12	93,500.00	286,400.87	96.12	3	3
North Dakota ..	2	13,612.50	27,225.00	2	13,612.50	27,225.00	32.0	..	..
Ohio	7	382,073.00	1,229,579.28	7	382,073.00	1,229,579.22	39.008	2	7
Oklahoma	1	50,029.37	100,058.75	1	50,029.37	100,058.75	25.0	..	..
Oregon	4	187,199.45	392,059.16	1	19,032.75	38,065.50	4.8	..	..
Pennsylvania ..	7	350,160.00	1,052,074.96	4	195,750.00	528,432.45	19.575	4	4
Rhode Island ..	1	34,997.13	85,444.16	1	34,997.13	85,444.16	3.66	1	1
South Carolina .	5	134,610.37	284,229.02	5	134,610.37	284,329.02	27.06	..	3
Texas	6	128,221.78	256,832.69	..	....	....	....	..	..
Utah	1	38,700.00	77,400.00	1	38,700.00	77,400.00	45.0	..	..
Vermont	9	52,442.58	104,885.19	9	52,442.58	104,885.19	12.56	..	1
Virginia	4	57,976.39	133,053.38	4	57,976.39	133,053.38	19.42	3	3
Washington	7	215,652.72	460,843.36	7	215,652.72	460,842.36	39.94	2	6
West Virginia	1	9,246.48	30,912.29	1	9,246.48	30,912.29	2.53	..	1
Wisconsin	3	37,450.49	112,351.50	..	....	....	....	..	2
Wyoming	5	35,896.16	131,462.32	3	11,287.67	22,575.32	28.72	..	..
	228	$5,664,442.31	$13,583,577.98	168	$4,052,142.85	$9,770,179.40	1,546.123	48	88

(a) Connecticut Project No. 2, and Maine Project No. 2 withdrawn after approval.

◆

Two Bridges, Over the Santee River in South Carolina, are to be built under the direction of the State Highway Commission, according to a recent report. It is stated, that the cost will be about $175,000 for each bridge. Four sites for the bridges have been proposed, as follows: Pinckney's Landing, Murray's Landing, Lanneau's Landing and Mazyck's Landing.

Road Contracts Awarded in Washington

The Washington State Highway Board has recently awarded two large contracts for the improvement of highways.

One contract is for the improvement of 10 mi. of road on the Sunset Highway in Grant County, between Vantage Ferry and Burke. The contract was awarded to the Quigg Construction Co., of Wenatchee, at $68,890. The engineer's estimate of the cost was $74,266.

The second contract is for the improvement of 30.5 mi. of road on the Central Washington Highway, between Pasco and Connell. A. L. Mitchell and C. M. Payne, of Spokane, were awarded the work at their bid of $52,984, the engineer's estimate being $54,238.

R. A. Meeker, State Highway Engineer of New Jersey, Resigns

Robert A. Meeker, State Highway Engineer of New Jersey, has resigned, effective April 1, 1918, and has been given leave of absence until that time.

Mr. Meeker is one of the best known highway engineers in the country and has a record of long and efficient service equalled by few public officials. He has been with the New Jersey Highway Department since 1900, serving under successive administrations and to his work is due, in large measure, the enviable reputation New Jersey has enjoyed as one of the most progressive states in road improvement. Until 1912, he was state supervisor of public roads, and since that time has been state highway engineer, the change being only in title.

Originally a mining engineer, Mr. Meeker had long experience in road work before becoming connected with the New Jersey department. During 1888 and 1889 he had charge of road work under a bond isue in Union County, New Jersey. From 1890 to 1897 he was street commissioner and city engineer of Plainfield, N. J., and from 1897 until his appointment in the New Jersey department he was engaged in road work in the White Mountains and railroad work in the Southwest.

Mr. Meeker's resignation is understood to have been tendered at the request of General Goethals, State Engineer of New Jersey, who, although convinced of Mr. Meeker's ability as an engineer and his sterling personal qualities, wished to be the sole authority in New Jersey road work.

Mr. Meeker is a man combining exceptional ability as an engineer with integrity, soundness of judgment and force of character that have made his services of very great value to the New Jersey department. By his resignation, he leaves a place that it will be difficult to fill.

Resolutions on State Highway Engineer Meeker's Resignation

At a meeting of the New Jersey State Association of County Engineers, held at Trenton on Dec. 12, the following resolutions were unanimously adopted:

WHEREAS, it has come to the knowledge of the New Jersey State Association of County Engineers that the resignation has been requested of Mr. Robert A. Meeker, State Highway Engineer,

RESOLVED, that the association records its belief that Mr. Meeker should be retained in his present position.

Mr. Meeker has acted as State Highway Engineer for the past 17 years or more, making it practically his life work. In this time the state has passed through many phases of road building in experimentation and construction work, due to changing traffic conditions, and in this time Mr. Meeker has acquired a state-wide knowledge of the roads and their needs, traffic conditions, local engineering problems, and other phases of road building, which is held by no other engineer, and which could only be acquired through similar long experience and many experiments.

During past years, the road department has been handicapped by poor legislation and lack of funds, in spite of which difficulties, Mr. Meeker's work has been highly efficient, and it is our belief that under the present highway act Mr. Meeker will have unlimited opportunities to show his fine worth to the people of this state.

In view of the great road building program now planned by the state, this association feels that Mr. Meeker's ability and knowledge render him peculiarly fitted to act as State Highway Engineer.

The New Jersey State Association of County Engineers, therefore, requests the Highway Commission to retain Robert A. Meeker as State Highway Engineer.

Contracts for Road Work to Be Awarded in Ohio

Bids for about 81 mi. of road improvement are to be received by State Highway Commissioner Clinton Cowen of Ohio on Dec. 27.

The work includes the construction of about 18.5 mi. of brick pavement, 10.1 mi. of bituminous macadam pavement, 5.9 mi. concrete pavement, 13.3 mi. of water bound macadam pavement, 26.8 mi. of brick or concrete pavement, 1.2 mi. of brick or bituminous pavement and about 5 mi. of grading and building drainage structures. The work is in 30 sections in Ashland, Clermont, Crawford, Franklin, Lake, Lawrence, Logan, Lucas, Mahoning, Mercer, Monroe, Muskingum, Ottawa, Seneca, Vinton and Van Wert Counties.

Among the larger jobs are the following: Ashland County, 4.72 mi., monolithic brick; estimated cost, $110,436,38; Clermont County, 4.12 mi., bituminous macadam, $26,689.85; Lake County, 7.715 mi., reinforced concrete; estimated cost, $198,618.64, or monolithic brick, $213,356.97; Lake County, 5.433 mi., reinforced concrete, $140,540, or monolithic brick, $150,814.29; Lucas County, 4.48 mi., concrete and water bound macadam, $73,334.15; Muskingum County, 6.15 mi., monolithic brick, $205,391.20, or reinforced concrete, $179,443.40, or brick on rolled foundation, $209,707.77; Muskingum County, 4.55 mi., monolithic brick, $144,860.38, reinforced concrete, $127,803.58, brick on rolled foundation, $154,403.84; Van Wert County, 4.30 mi., water bound macadam, $50,142.45.

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Good Wagon Roads and Trails are More Needed in Alaska than railroads, according to a recent statement, credited to Brig.-Gen. W. P. Richardson, President of the Board of Road Commissioners for Alaska. Gen. Richardson has been in charge of road work in the territory for a number of years and is fully acquainted with the needs of the country. He reports that the plea of the Alaskans is for "passable routes for man and beast, with the bridging of dangerous streams; and as traffic and tonnage develop, improved roads for the use of wagons and motor cars."

The Gallatin County Good Roads Association was organized at a recent meeting at Bozeman, Mont. L. D. Blodgett was elected president and J. A. Harader, Manager of the Bozeman Chamber of Commerce, was elected secretary-treasurer. Directors were elected as follows: William Davis, Bozeman; Martin Jacoby, Manhattan; Wallace Fisher, Belgrade; E. R. Avery, Three Forks; Eugene Thorndike, Willow Creek; W. E. Westlake, Amsterdam; Whitfield Spain, Menard and Maudlow; J. F. Cashman, Logan; Mr. Andrews, Trident.

The Employment of Prisoners in the United States Army and Navy Prisons in the Construction of Military Roads is provided for in a bill introduced in Congress by Senator Hoke Smith of Georgia. The purpose of the bill is to provide for the use of prison labor in the production of war supplies. It authorizes the Secretary of War and the Secretary of the Navy to employ military prisoners in the manufacture of war supplies and in the construction of military roads, to make agreements for the use of the required machinery and the obtaining of material, and to supervise the work of state and county highway officials who may be charged with the development of the proposed roads. It is also stated that the employment of German prisoners of war, interned in the United States, requires no legislation and that it is being carefully considered by the departments concerned. A similar plan has been tried in Switzerland, it is stated, and has resulted in considerable benefit to that country's highway system.

MEETINGS

Calendar of Coming Meetings

Dec. 28.—American Association for the Advancement of Science.—Annual meeting, Section D, Engineering. University of Pittsburgh, Pittsburgh, Pa. Secretary (Section D), Arthur H. Blanchard, Columbia University, New York, N. Y.

Jan. 12, 1918.—Northwestern Society of Highway Engineers.—Annual meeting, Benson Hotel, Portland, Ore. Secretary, C. G. Reiter, Hillsboro, Ore.

Jan. 15-17, 1918.—Virginia Good Roads Association.—Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

Jan. 22-24, 1918.—American Wood Preservers' Association—Annual meeting, Chicago, Ill. Secretary F. J. Angier, Baltimore & Ohio Railroad, Mount Royal Station, Baltimore, Md.

Feb. 7-9, 1918.—American Concrete Institute.—Annual convention, La Salle Hotel, Chicago, Ill. Secretary H. B. Alvord, 27 School St., Boston, Mass.

Feb. 8-9, 1918.—American Concrete Pipe Association.—Annual convention. Sherman Hotel, Chicago, Ill. Secretary, J. H. Libberton, 208 S. La Salle St., Chicago, Ill.

April 15-17, 1918.—United States Good Roads Association.—Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

April 18-19, 1918.—Bankhead National Highway Association.—Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

American Association for the Advancemeut of Science

The annual meeting of Section D, Engineering, of the American Association for Advancement of Science will be held in Room 107, Thaw Hall, University of Pittsburgh, Pittsburgh, Pa., at 10 a. m., Friday, Dec. 28. Among the papers scheduled for the meeting are the following:

"Relative Efficiency of Different Methods of Repairing Bituminous Macadam and Bituminous Concrete Pavements," by George H. Biles, Second Deputy State Highway Commissioner of Pennsylvania.

"The Efficiency of the Application of Cold Bituminous Materials for Surface Treatments on Gravel and Broken Stone Roads," by Julius Adler, Engineer of Tests, Pennsylvania State Highway Department.

"Economic Surfaces for Floors of Steel Truss Highway Bridges," by Willis Whited, Bridge Engineer, Pennsylvania State Highway Department.

"Present Status of Granite Block Pavements," by C. D. Pollock, Consulting Engineer, New York, N. Y.

"Rattler Tests for Paving Brick of Various Depths," by Wm. C. Perkins, Chief Engineer, The Dunn Wire-Cut Lug Brick Co.

"Motor Trucks and Long Distance Highway Transportation," by Maurice B. Greenough, Chief Engineer, National Paving Brick Manufacturers' Association.

"The Construction and Maintenance of Highways under War Conditions," by Arthur H. Blanchard, Consulting Highway Engineer, New York, N. Y.

The officers of Section D are: Henry S. Drinker, Vice President and Chairman of the Section; Frederic L. Bishop, Member of Council; Daniel D. Jackson, Member of General Committee, and Arthur H. Blanchard, Secretary.

The members of the Sectional Committee are: H. S. Drinker, H. M. Howe, G. W. Bissell, W. Bowie, C. S. Howe, P. Hubbard, A. E. Burton and A. H. Blanchard.

A road convention in the interests of the Ozark Trail was held at Coffeyville, Kan., on Dec. 6. The meeting was largely attended by farmers from the neighborhood.

PERSONAL NOTES

W. J. Hazeltine has resigned as City Engineer of Mansfield, Ohio.

A. B. Carson, formerly City Engineer of Bryan, Tex., has been given a captain's commission in the army.

H. Gordon Hinkle, formerly County Engineer of Blair County, Pa., has been appointed City Manager of Altoona.

R. L. Longshore, formerly Deputy County Engineer of Adams County, Ind., has resigned to take up railway work.

J. J. Jessup, formerly City Engineer and Superintendent of Streets of Berkeley, Cal., has resigned to enter private practice.

D. R. Thornton, formerly with the New York State Department of Highways, has resigned to take up other work for the city of Beaumont, Tex.

F. G. Ayers, formerly employed in the Federal Land Office at Phoenix, Ariz., has been made Assistant County Engineer of Maricopa Co., Ariz.

Howard J. Teas, formerly Junior Highway Engineer of the Illinois State Highway Department, has been transferred to the 27th Engineers from the 23d Engineers.

Edward C. Thomes has resigned as City Engineer of Poplar Bluff, Mo., to become a drainage engineer in the Office of Drainage Investigation, U. S. Department of Agriculture.

James D. Gray, formerly of the Minnesota Highway Department has been appointed Engineer of Federal Aid Project No. 3 which involves the construction of a road across Mille Lacs County.

Philip D. Thurmond, Engineer of the Fulton Special Road District, Montgomery County, Mo., has been put in charge of the construction work of the road across the Mineola District in the same county.

Clyde C. Kennedy, formerly Assistant City Engineer of Berkeley, Cal., has been made City Engineer and Superintendent of Streets to succeed J. J. Jessup, whose resignation is noted elsewhere in this column.

J. B. Clingman, formerly Road Engineer of Madison County, N. C., has been appointed Supervisor of Road Maintenance for the western district of that state. Mr. Clingman will make his headquarters at Asheville.

Edward E. Reed, formerly Division Engineer, New Jersey State Highway Department, has been made Assistant State Highway Engineer, vice W. D. Thompson whose promotion to Acting State Highway Engineer is noted elsewhere in this column.

W. D. Thompson, formerly Assistant State Highway Engineer of New Jersey, has been made Acting State Highway Engineer, succeeding Robert A. Meeker, who, as noted on another page, has been given leave of absence until April 1, 1918 when his resignation becomes effective.

GOOD ROADS

A Weekly Journal of Road and Street Engineering and Contracting

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THE HIGHWAY CONTRACTOR AND ROAD BUILDER

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NEW YORK, DECEMBER 29, 1917

Number
26

Tests of the Influence of Grading on the Value of Fine Aggregates for Concrete Road Work.

The behavior of a concrete pavement depends upon a variety of factors, one of which is the character of the concrete in the roadway. This, in turn, is governed by a variety of factors, among which are the qualities of the fine aggregate used. For the purpose of determining the influence of one characteristic of this aggregate—that of grading—an elaborate series of tests was made by F. H. Jackson, Assistant Testing Engineer of the Office of Public Roads and Rural Engineering, U. S. Department of Agriculture, and was described by him in the "Journal of Agricultural Research," Vol. X, No. 5. A reprint of his discussion of the tests was noted in "Good Roads" for Nov. 24.

In discussing the general problem, Mr. Jackson pointed out that the three agencies particularly destructive to the concrete road, are traffic, weather and constructional defects. Again, traffic acts as a destructive force in three ways:

(1) Iron tires cause an abrasion or grinding away of the particles composing the surface of the pavement, which varies inversely with the hardness of the concrete. (2) Suddenly applied loads, horses' hoofs, etc., subject the pavement to impact, tending to loosen and sometimes fracture the individual fragments composing the aggregate, and is resisted by the property of toughness in the material. (3) The actual weight of traffic as transmitted by wheel loads produces also compressive stresses proportional to the unit loads, but these are of much less importance in causing wear than are the stresses produced by abrasion and impact. The combined destructive effect of abrasion and impact, therefore, may be called the effect of wear, so that any concrete which will successfully resist these two forces may be said to possess high resistance to wear.

Traffic, according to Mr. Jackson, is without doubt the most important destructive agency acting upon the road so far as the ultimate life of the pavement is concerned, not only because its effects are cumulative, but also because they serve to hasten deterioration started by other causes. Bearing this in mind, he argues, it follows that a determination of the suitability of concrete for road use should be essentially the determination of its resistance to wear; also, since resistance to wear means resistance to both abrasion and impact, it would seem logical to apply tests for hardness and toughness or a single test which would serve for both these qualities.

The experimental work done consisted of making hardness, toughness, tension and compression tests on specimens composed of mortar in which an artificially graded sand was used. The sand employed was Potomac River concrete sand, an analysis of which is shown in Table I. This sand was divided into three sizes as follows:

(1) A coarse sand (C) composed of equal parts of material passing a ¼-in. screen but retained on a 10-mesh sieve and that passing a 10-mesh but retained on a 20-mesh sieve.

(2) A medium sand (M) composed of equal parts of 20 to 30-mesh, 30 to 40-mesh and 40 to 50-mesh material.

(3) A fine sand (F) composed of the run of sand below No. 50.

The fine sand contained about 10% material that passed the 200-mesh sieve.

These sands were recombined into 60 different combinations of coarse, medium and fine. The proportions of each of these 60 combinations and the equivalent mechanical analyses are shown in Table II.

Test specimens were standard mortar briquettes and 2x2-in. cylinders composed of 1 part of cement and 2½ parts of sand, by weight. Various percentages of water were used in order to bring all of the batches to as nearly the same consistency as possible, judging the consistency by eye. The specimens were stored in moist air one day and in water six days and were then tested.

Mr. Jackson's description of the tests and their results is as follows:

Hardness Tests

Specimens for the hardness tests were prepared by drilling 1-in. cores through the center of the 2-in. cylinders and drying them thoroughly in a hot-air oven. They were tested then for hardness in the same manner as the hardness of rock is obtained, as described above, by holding the ends of the specimens against a revolving steel disk upon which quartz sand was fed as the abrasive. The specimens were weighed carefully before and after 1,000 revolutions of the disk, and the loss in weight was used as an index of the hardness of the mortar. The results of the hardness tests on all the sand mixtures studied are shown in Fig. 1, in which the loss in weight of the various specimens is plotted on a Feret triangle at the points indicating the proportions of coarse, medium and fine sand in the mix. Several interesting facts are shown in this figure. First, it is seen that the loss in weight of all specimens is practically constant for all mixtures containing more than 10% of the coarse sand. This loss, averaging about 5 gm., is very slightly more than would be obtained on a specimen of solid quartz tested in the same way. In other words, the hardness of all specimens containing an appreciable amount of sand over 20-mesh in size appears to be a function of the hardness of the aggregate itself independent of the grading. On referring to the specimens containing various percentages of medium and fine sand, but no coarse, it will be noted that the loss in weight is very much greater, amounting in two cases to more than 250 gm. By assuming that the actual hardness of the coarse and medium sand grains is the same, in view of the fact that the sand was composed of practically pure quartz, these results show that the use of the fine sand has so weakened the adhesion between the cement and the individual particles of aggregate by enormously increasing its superficial area that the specimens disintegrated readily under the action of the abrasive.

In order to determine the hardness of mortar containing very fine sand in a rich mix, as compared to the 1:2½ mixes, a few tests were made using sands artificially graded as above in the proportion of 1 part of cement to 1½ parts of sand. In the case of mixtures containing coarse sand, losses practically identical with those shown on Fig. 1 were found. In the case of the very fine sands, however, an average loss of about 40 instead of 200 was noted. This would indicate that the hardness of a mortar containing a large amount of extremely fine sand may be increased considerably by increasing the quantity of cement. Even in this case, however, the average loss is greatly in excess of that obtained by the use of a coarse sand.

TABLE I.—MECHANICAL ANALYSIS OF NATURAL SAND.

Mesh of sieve.	Percentage passing.
Between ⅛-in. and No. 10	15.9
Between Nos. 10 and 20	21.8
Between Nos. 20 and 30	21.2
Between Nos. 30 and 40	13.3
Between Nos. 40 and 50	7.9
Between Nos. 50 and 80	11.4
Between Nos. 80 and 100	2.4
Between Nos. 100 and 200	3.3
Under 200	2.8
Total	100.0

TABLE II.—PROPORTION OF ARTIFICIALLY GRADED SANDS.

Laboratory No.	Proportions. C. %	M. %	F. %	Equivalent mechanical analysis—per cent. between ⅛-in. & No. 10.	10 & 20.	20 & 30.	30 & 40.	40 & 50.	Under No. 50.
1	100	0	0	50	50	0	0	0	0
2	80	0	20	40	40	0	0	0	20
3	80	10	10	40	40	3.3	3.3	3.3	10
4	80	20	0	40	40	6.6	6.6	6.6	0
5	70	0	30	35	35	0	0	0	30
6	70	10	20	35	35	3.3	3.3	3.3	20
7	70	20	10	35	35	6.6	6.6	6.6	10
8	60	0	40	30	30	0	0	0	40
9	60	10	30	30	30	3.3	3.3	3.3	30
10	60	20	20	30	30	6.6	6.6	6.6	20
11	60	30	10	30	30	10	10	10	10
12	60	40	0	30	30	13.3	13.3	13.3	0
13	50	0	50	25	25	0	0	0	50
14	50	10	40	25	25	3.3	3.3	3.3	40
15	50	20	30	25	25	6.6	6.6	6.6	30
16	50	30	20	25	25	10	10	10	20
17	50	40	10	25	25	13.3	13.3	13.3	10
18	40	0	60	20	20	0	0	0	60
19	40	10	50	20	20	3.3	3.3	3.3	50
20	40	20	40	20	20	6.6	6.6	6.6	40
21	40	30	30	20	20	10	10	10	30
22	40	40	20	20	20	13.3	13.3	13.3	20
23	40	50	10	20	20	16.6	16.6	16.6	10
24	40	60	0	20	20	20	20	20	0
25	30	0	70	15	15	0	0	0	70
26	30	10	60	15	15	3.3	3.3	3.3	60
27	30	20	50	15	15	6.6	6.6	6.6	50
28	30	30	40	15	15	10	10	10	40
29	30	40	30	15	15	13.3	13.3	13.3	30
30	30	50	20	15	15	16.6	16.6	16.6	20
31	30	60	10	15	15	20	20	20	10
32	20	0	80	10	10	0	0	0	80
33	20	10	70	10	10	3.3	3.3	3.3	70
34	20	20	60	10	10	6.6	6.6	6.6	60
35	20	30	50	10	10	10	10	10	50
36	20	40	40	10	10	13.3	13.3	13.3	40
37	20	50	30	10	10	16.6	16.6	16.6	30
38	20	60	20	10	10	20	20	20	20
39	20	70	10	10	10	23.3	23.3	23.3	10
40	20	80	0	10	10	26.6	26.6	26.6	0
41	10	0	90	5	5	0	0	0	90
42	10	10	80	5	5	3.3	3.3	3.3	80
43	10	20	70	5	5	6.6	6.6	6.6	70
44	10	30	60	5	5	10	10	10	60
45	10	40	50	5	5	13.3	13.3	13.3	50
46	10	50	40	5	5	16.6	16.6	16.6	40
47	10	60	30	5	5	20	20	20	30
48	10	70	20	5	5	23.3	23.3	23.3	20
49	10	80	10	5	5	26.6	26.6	26.6	10
50	0	0	100	0	0	0	0	0	100
51	0	10	90	0	0	3.3	3.3	3.3	90
52	0	20	80	0	0	6.6	6.6	6.6	80
53	0	30	70	0	0	10	10	10	70
54	0	40	60	0	0	13.3	13.3	13.3	60
55	0	50	50	0	0	16.6	16.6	16.6	50
56	0	60	40	0	0	20	20	20	40
57	0	70	30	0	0	23.3	23.3	23.3	30
58	0	80	20	0	0	26.6	26.6	26.6	20
59	0	90	10	0	0	30	30	30	10
60	0	100	0	0	0	33.3	33.3	33.3	0

In Fig. 2 the results of the 1:2½ mortar tests are shown plotted on rectangular co-ordinates with the percentage of sand over 200-mesh as abscissae and the loss in weight per 1,000 revolutions as ordinates. Each point plotted represents the average of the results on all values obtained originally with the percentage of coarse sand as indicated. For instance, the average of all combinations of medium and fine sand with 20% coarse showed a loss of 6 gm., and this value is plotted on the curve. This graph shows the great effect of coarse sand on the hardness of mortar. The corresponding curve (not shown) for the hardness of 1:1½ mortars was found to be practically identical, except that the average loss for mortars containing no percentage of sand over 20-mesh was 40 instead of 200.

Fig. 3 shows the results of a number of hardness tests made on a series of mortar specimens, in which the grading of the sand remained constant and the percentage of cement varied. In these tests the unscreened Potomac River sand, similar in quality to the artificially graded sands, was used. It will be seen that the hardness values of the mortar specimens are all greater than neat cement. Furthermore, there is very little difference in the loss in weight between the 1:1, 1:1½, 1:2, and 1:3 mixes, all of which show about the same hardness as was obtained with the artificially graded coarse sands. The somewhat greater loss sustained by the 1:4 mortar specimen, no doubt, is due to the very lean mix, which allowed the mortar to disintegrate under the test in much the same way as noted above for very fine sand.

Toughness Tests

Toughness tests were made on 2x2-in. cylinders, using the Page impact machine for testing rock. The procedure was similar to that employed in the standard rock test, except that a 2-in. instead of a 1-in. cylinder and a ½ instead of a 2-kg. hammer were used. The test consisted of a 1-cm. fall of the hammer for the first blow, followed by a 2-cm. fall, etc., until the cylinder was fractured. The height of blow at failure in centimeters was used as an indication of the relative toughness of the mortar. The results of tests are plotted in Fig. 4, using the Feret triangle. Each result plotted is the average of three tests. An inspection of the diagram shows at once that considerable variation in toughness may be obtained, owing to differences in sand grading, but that, in general, toughness increases with the percentage of coarse sand in the mix. The contour lines, which bound areas of equal toughness, show in a general way the relative resistance to impact developed by the use of different mixtures. The area of maximum toughness is seen at the top of the triangle and includes sand having from 60 to 90% of coarse, from 0 to 20% of medium, and from 5 to 35% of fine material. The area of minimum toughness, as would be expected, lies toward the lower left-hand corner and includes the very fine sands. It may be noted, also that with a given percentage of coarse sand, say 50, the highest results were obtained when the proportions of medium and fine sand were about equally divided. On the other hand, for a given percentage of either medium or fine sand, the toughness appears to increase as the proportion of coarse sand increases. In general, it would seem that the toughness of a cement mortar increases with the amount of coarse sand present in the aggregate up to the limit of maximum toughness, which, for this mix appears to be obtained with a sand having about 80% of coarse, 10% of medium and 10% of fine material. The general effect of coarse sand on toughness is shown clearly in Fig. 5, which is replotted from the results shown in Fig. 4 in the same way as the results of the hardness tests previously referred to.

A series of tests made with the view of determining the effect of richness of mix on the toughness of cement mortar is shown, for comparison, in Fig. 6. The results are plotted with the percentage of cement as abscissae and toughness as ordinates. Each plotted result is the average of nine tests. These results are of interest in showing the large increase in toughness produced by increasing the cement content. This increase appears to be practically proportional to the percentage of cement up to a 1:1 mix, after which the addition of more cement affects the toughness very little. In other words, a neat cement briquette is no tougher than one composed of equal parts of cement and a typical concrete sand, which in turn shows twice the resistance to impact of one containing only 20%. Inasmuch as this sand was very well graded and contained only 35% of voids, it is obvious that a considerable excess of cement over that required to fill the voids is required to reach the condition of maximum toughness. In other words, these results present an experimental verification of the theory which requires the use of a rich mix in the surface of a concrete pavement, especially as has been seen by reference to the hardness test shown in Fig. 3 that the hardness of a rich 1:1½ mix is practically the same as a 1:3 and greater than a 1:4 mix.

Tension and Compression Tests

The results of the tension and compression tests are shown in Figs. 7 and 8. They were made in the usual way on standard briquettes and 2x2-in. cylinders. Each value in tension is the average of six tests, and each value in compression the average of three tests. The average total variation in individual results of each set was 10% for tension and 5% for compression. The results show graphically the enormous variation which may be obtained in both the tensile and compressive strength of mortar by reason of variations in the grading of the sand. The contour lines are much more regular than those showing variations in toughness. The following points may be noted:

Tension.—Sands showing maximum results in tension are composed of from 60 to 80% coarse, 0 to 20% medium, and 10 to 30% fine, whereas the weakest sands are those composed of from 0 to 10% coarse, 0 to 20% medium, and 80 to 100% fine. A sand composed of 100% coarse is 35% stronger than one composed of medium only and 80% stronger than one composed of fine only, but is nearly 40% weaker than the sand of maximum strength (70-10-20). The total variation in strength is 250 lb. per sq. in., or 54% from the average of the 60 determinations.

Compression.—Sands showing maximum results in compression are composed of from 60 to 80% coarse, 0 to 20% medium and 10 to 30% fine, the same limits as for tension. A sand composed of 100% coarse is 95% stronger than one composed of fine only, but is 35% weaker than the strongest sand (70-0-30). The total variation in strength is 2,505 lb. per sq. in., or 100% from the average of 60 determinations.

In Figs. 9 and 10 the results of the tension and compression tests are replotted on rectangular co-ordinates to show the effect of the coarse sand (¼-in. to No. 20 mesh) on the strength of the mortar. The most interesting feature about these curves, apart from their regularity, is the very great

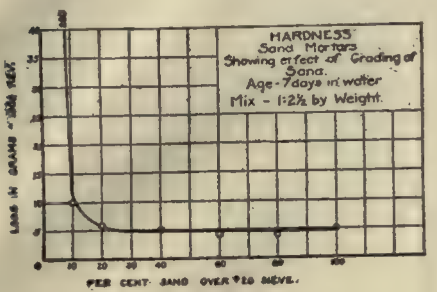

Figure 2.

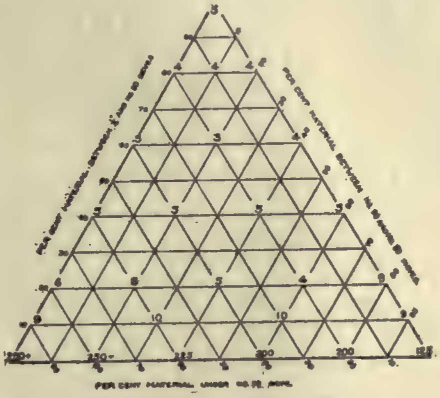

Figure 1.

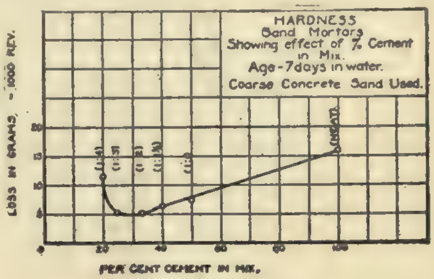

Figure 3.

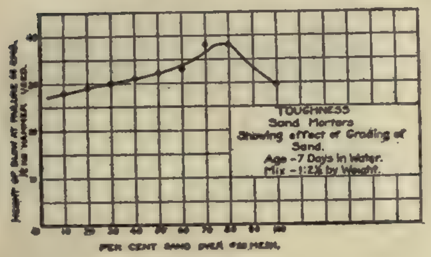

Figure 5.

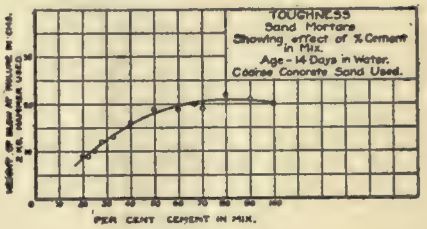

Figure 6.

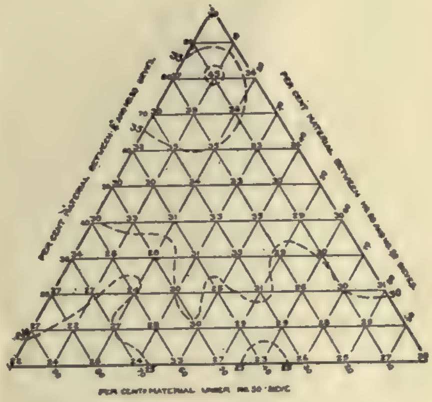

Figure 4.

Graphs and Curves
Tests on Sand Mortars
Graphs:
Artificially Graded Sand:
Fig. 1- Hardness Tests
Fig. 4- Toughness Tests
Fig. 7- Tension Tests
Fig. 8- Compression Tests
Curves:
Artificially Graded Sand:
Fig. 2- Hardness Tests
Fig. 5- Toughness Tests
Fig. 9- Tension Tests
Fig. 10- Compression Tests
Natural Concrete Sand:
Fig. 3.- Hardness Tests
Fig. 6- Toughness Tests

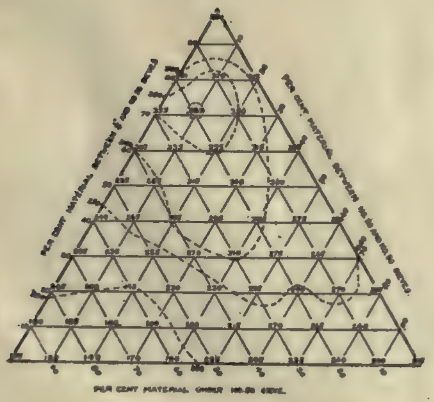

Figure 7.

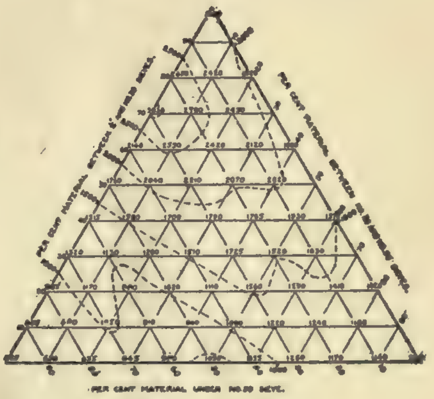

Figure 8.

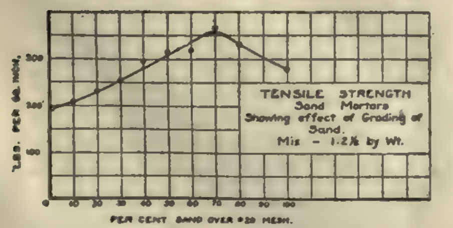

Figure 9.

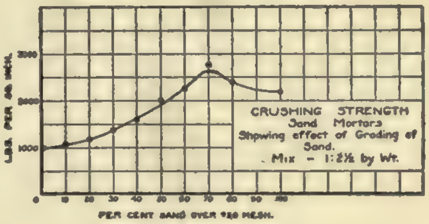

Figure 10

(Continued on page 336)

The Maintenance of Earth Roads[*]

By John H. Mullen[†]

The problem of earth road maintenance is of paramount importance at this time by reason of the necessity for placing the farm tonnage roads in the best possible condition; also on account of the probable restriction of extensive construction activities due to the high cost of material and labor, and the need for conservation of the man power of the country.

The roads in the United States, estimated at 2,500,000 mi., are reported as being surfaced to the extent of about 275,000 mi. or 11%. It is a fact that this small percentage of surfaced roads does carry a large percentage of the actual wheel traffic, but it is very doubtful whether it carries such a large proportion of the farm tonnage. In the Mississippi Valley, which furnishes the bread, butter and meat for the United States and her allies, the bulk of this tonnage is hauled over earth roads, and it appears to me that the betterment of such roads has become a very important measure of national preparedness. We are all agreed that an all-weather hard road is the ideal condition, but we are now up against this straight business proposition: There are millions of tons of foodstuffs which have to be transported from farm to market. The generally poor condition of the earth roads over which most of this material must be hauled, is at the present time a limiting factor. The decrease in the cost of hauling, if the roads were surfaced, would more than pay for such surfacing. But are we justified in going into such a program at this time, even though funds are available and we know it would be the most economical in the long run? I would say that, on the contrary, our heavy construction activities should be confined to the permanent grading and surfacing of those trunk lines which must be improved in order to carry the tonnage, and that the other available funds be used, so far as is necessary, for the intensive maintenance of the general road system, the remainder being set aside for use in construction after the war, when such work may be done at a lower cost, and when such activities will provide work for the thousands of men who will be without employment at that time. This theory is not advanced with the idea of cutting down the levies for raising road funds. Those levies should continue to be made and set aside for future use, but the idea is this: The man power of this nation is needed in the activities of war and production of food, and every thousand dollars paid for other work which could be dispensed with, means just that much less man power to prosecute the war. Not only that, but the amount of paving or other surfacing which might be done in the next year or two, outside of the necessities of main line traffic, would be negligible as a relief for farm tonnage traffic conditions; while the proper application of intensive road maintenance will facilitate the moving of crops. And what is more important from an administration standpoint, the adoption of such a policy gives an opportunity to inaugurate a general maintenance system which it would otherwise take years to accomplish.

I have seen hundreds of thousands of dollars worth of ditch roads in northern Minnesota, which do not come under highway jurisdiction, made practically valueless and the country left almost inaccessible for the reason that no provision was made for their maintenance. The same condition obtained in a lesser degree on the other roads in the state, until the highway commission was organized and Mr. George W. Cooley, who was then state engineer, set in motion the state road maintenance system. This met with the usual opposition presented to any new form of public work, with claims of waste of public funds, etc. But with an efficient corps of engineers in charge of the work, results have been accomplished which are very satisfactory to the state, and insure the traveling public and the farmers using the state roads a reasonably good road at all times, regardless of the original condition of those roads—all through maintenance. Now the point of the situation is this: The people using the ditch roads and also the other roads before they became state roads knew about road drags and road machines. We are told that the use of the road drag was advocated as far back as 1851. They were not used, except spasmodically, and the desired results were not obtained. Why? Because, in the first place, dragging is only a part of the maintenance job, but mainly because of the lack of organization. It has been considered by many, that placing a few road drags in the hands of farmers living along the roads, with instructions to use them after every rain, would solve the earth road maintenance problem, but after several years' experience, it is demonstrated that this is a problem requiring as much thought and organization by the road engineer as does construction. While it is true that local conditions call for different methods in the details of work, there is a fundamental governing the successful prosecution of all road maintenance, and that is organization, with centralized control and a line of personal responsibility.

The most efficient and workable unit for organization of general road maintenance is the county. A lesser unit does not permit the employment of the proper superintendent, while a larger unit—several counties for instance—excepting for general supervision by the state, does not permit of sufficient attention to detail.

When a county is required by law, or has otherwise determined to take over the maintenance, the first act should be the employment of a competent superintendent, and experience in Minnesota proves that best results are obtained when the county highway engineer is given this assignment. When this is done, the whole situation should be gone over, a maintenance survey made, in fact, by the engineer, with a general report and layout of work presented to the board for approval and as a basis for the maintenance budget. The board should then place at the disposal of the engineer the necessary funds to carry on the work, delegate to him authority for conducting the work and for employment and discharge of forces, and from that point hold him responsible for results, not interfering with the details of work or organization, but acting only in an advisory capacity.

The organization of the work depends largely upon local conditions, but in the first place the scope of the work must be determined. This should go far beyond the ordinary idea of only keeping the ruts filled by dragging. In fact, it should include all minor betterments on roads which have not been improved as well as on the improved sections. On approximately 4,000 mi. of earth road coming under my observation, which was reasonably well maintained, reports show that in general the proportionate costs of work run as follows: Reshaping $12 per mi.; dragging $16 per mi.; miscellaneous repairs $12 per mi.

To efficiently maintain traffic over a highway it is necessary, first, that no water stand on the roadway or in the side ditches or gutters, and that defects in the surface be repaired or improved by the addition of such material as may be required in places to form a crust which will maintain the loads and resist wear, then to follow up with dragging and planing. The general repairs and minor improvements should be made in the early spring and late fall by special crews, which, on account of the engineer having charge of both classes of work, may be assigned to necessary construction during the time they cannot be employed economically on maintenance. The shaping or reshaping of roadways and cleaning of ditches can best be accomplished by a blade grader which is the most efficient implement for general maintenance, and can be hauled to best advantage by a tractor. The general repairs must, of course, be taken care of by men and teams, while the dragging and planing is developing into a tractor proposition. The unwillingness of farmers to use their teams on this work at the time they are needed is forcing the use of light tractor outfits which can care for four or five times as much road as teams. The use of rebuilt Ford machines is becoming quite general, especially the convertible attachments which allow the machine to be used as a runabout when not employed on dragging. Many of our maintenance men have such machines which can be converted in about half an hour. Such equipment gives more attractive employment, permits of 6-mi. to 10-mi. dragging sections instead of the usual 1-mi. to 2-mi. divisions, and allows for continuous work during hot weather or when flies annoy teams. In many cases, to my knowledge, dragging has been done in this way at night, which is unheard of with teams. The cost of tractor dragging is, all things considered, about the same as team work but is a great deal more efficient and reliable. As a general thing two planers are hauled at one time with a tractor.

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[*] Paper presented at the annual meeting of the American Association of State Highway Officials, Richmond, Va., Dec. 4-6, 1917.

[†] Deputy Commissioner of Highways, Minnesota State Highway Department.

The type of drag to be used is quite important. The split log type and the two-blade steel drag have been greatly improved upon and we now have various modifications of the road planer which do away with the waviness caused by the ordinary drags. The planer instead of gouging out the soft material in the low spots will bridge and deposit earth in those places and cut off the elevations or humps while with a two-blade drag the reverse is done on account of the blades following the contour of the ground. To the traveling public, the smoothness of the wheel track is the measure of success in road administration; therefore, the proper design of planer should be carefully studied for each class of soil. No definite rule can be laid down for the number of times or the proper time at which a road should be dragged. This again depends upon local conditions. A sandy soil can best be handled when wet, while a gumbo must be treated when it is mellow or almost dry. In one section of our state, the best results are obtained by dragging during a rain when the road is saturated. The dragger should be given an idea of the general principle of dragging; that the puddling of thin layers of earth in the roadway will tend to build a crust.

The use of oil in maintaining the surface of earth roads is being advocated in many places, but in my judgment this treatment should only be used on properly graded roads, of which there is not a very large percentage. When a good grade of oil is properly applied to a well drained and graded road, a comparatively dustless and mudless surface is provided and the dragging is nearly eliminated, but it is a mistake to oil a road which is not in condition for surfacing, and oiling should be done only under experienced supervision.

As stated before, the elements of success in maintenance are organization and personal responsibility. The work should be laid out in definite sections, with a foreman in responsible charge of each. This foreman must, of course, work under the supervision of the engineer, but his instructions should be general in nature rather than too specific, so that initiative will be encouraged. A very important factor in the work is the keeping of cost data and filing of complete reports. It is found that if the maintenance foreman is furnished with a comprehensive system of accounting and reporting greater interest in the work will be developed.

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The Maintenance of Gravel Roads*

By Paul D. Sargent†

In discussing the maintenance of gravel roads I shall speak with reference to a first-class gravel road, i. e., a road that has been constructed along the following lines:

The subgrade and drainage have been as carefully built as for any type of construction; the subgrade is thoroughly built and carefully rolled, and subdrainage and surface drainage were provided at every place where the need was apparent. The gravel surface was constructed in two courses, following substantially the specification for a water bound macadam road, except the substitution of gravel for crushed stone. The maximum size of stone in the bottom course, which was 4 in. in thickness after rolling, was 3 in. and varied from that size to ¼-in. material. The maximum size of material in the top course, which was 4 in. in thickness after rolling, was 2 in. in diameter and varied from that size to ¼ in.

These roads were built under the specification in use in 1914. We now build our gravel roads in three courses, the bottom course as described above, the second course, 3 in. in thickness, containing stone not larger than 2 in., and the top course, 1 in. in thickness, containing stone not larger than ¾ in. This change in construction we have made as a result of our experience in maintaining gravel roads.

We follow two general methods of maintenance, depending upon the amount of traffic; and I have selected two sections which may be considered typical with respect to the amount of traffic carried and the method of maintenance which we employ.

Let us consider first a gravel road constructed as above outlined, which carried for four months in the year an average traffic of over 1,200 vehicles per day and on Sundays and holidays a traffic running from 3,000 to 3,500. During the past three years we have maintained this road by early patching and dragging and shaping with gravel. This work begins as soon as the snow has left the ground and the surface of the road begins to soften up, which, with us, is about the middle of April. About the 20th of May we make an application of Tarvia B; the road is prepared by sweeping with a horse-sweeper and hand-brooms to remove any loose particles of dirt or dust. The tar is applied at the rate of about .4 gal. per sq. yd. of surface. Formerly we allowed the tar to stand about half a day for the purpose of penetrating into the surface of the road, but traffic is so heavy that during the past two seasons we have immediately followed the application of the tar with a light covering of sand, using 1 cu. yd. of sand to about 100 sq. yd. of surface. The sand, of course, is drawn out and stacked in piles of about 1/6 cu. yd. along the shoulder of the road prior to the application of the tar.

In 1915, where we used this method of surface treatment, our first application was made between May 20 and June 30 and we used .3 gal. per sq. yd. About the middle of August we made another application, using .2 gal. per sq. yd. for the second application. Each year since we have treated this surface with one application of Tarvia B, using an average of .4 gal. per sq. yd. This application is made as soon after the 20th of May as weather conditions will permit. Of course, we have to apply the tar during warm, dry weather.

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*Paper presented at the annual meeting of the American Association of State Highway Officials, Richmond, Va., Dec. 4-6, 1917.

†Chief Engineer, Maine State Highway Commission.

The work of preparing the road surface for treatment and delivering and applying the sand is done by our own forces. Until this year the tarvia has been applied to the road by the concern from which it is purchased at a price of 8.5 ct. per gal., applied. Our superintendent of maintenance controls the amount of the application, i. e., the same quantity is not applied to every section of the road. In some places where the drainage and surface are perfect the surface treatment does not break up through the winter, and in such places as little as 1/6 or ¼ gal. is applied the subsequent year.

Most of the surface treated gravel, however, breaks up after freezing and thawing begins in the fall. After the snow leaves in the spring the tar crust breaks up into scales of perhaps ¼ to ½ in. in thickness and in sections having a surface area anywhere from 1 in. to 1 ft. square. The real difficult part of maintaining the tar surface on a gravel road is in connection with the manipulation of the surface after it is broken up in preparation for a subsequent treatment. This is usually done by dragging the surface frequently. Of course, the earlier this work is undertaken the easier it can be accomplished when there is more or less moisture in these scales.

We have several miles of gravel surface treated as above through three successive seasons and this treatment has proved to be very satisfactory.

When the tar is first applied the surface is very sticky and slippery, and it is dangerous for automobile traffic. In two or three days, depending on the weather conditions, the surface begins to iron out, and in four or five days it usually presents an enameled appearance. If the surface beneath is firm, this appearance will be maintained through the entire season. If there are any pockets of dust or soft places in the gravel surface the tar surface will break up and such places have to be immediately attended to by the patrolman. We do this patching in two ways, either by mixing sand and Tarvia B together in the proportion of 1 gal. of tar to 1 cu. ft. of sand, putting that in the hole and then patting it down with a shovel, or, if the broken place is found soon enough, the patrolman simply gives it a little brush of tar with an old broom. Sometimes he throws a light sprinkling of sand over the tar and sometimes he does not.

The edges of the tar treatment are inclined to crumble off as a result of traffic turning out over them, and a good deal of the patrolman's time is taken up with patching the edges with the mixture of tarvia B and sand already referred to.

TABLE I—MAINTENANCE COSTS ON STATE HIGHWAY "A," KENNEBUNK.

Gravel Surface; 2.74 mi.; surface treated with Tarvia B.

	1915.	1916.	1917.
Patrolman's wages	$209.81	$329.16	$417.53
Extra help	91.28	624.87	450.59
Material	1,036.99	1,309.49	1,250.68
	$1,338.08	$2,263.22	$2,118.80
Inspection	25.10	182.03	175.00
Total cost	$1,363.18	$2,445.25	$2,293.80
Cost per sq. yd	0.053	0.095	0.088

Distribution of Cost.

	1915.	1916
Cutting bushes	$00.00	$26.82
Dragging	112.28	67.54
Raking rocks	16.38	21.70
Cleaning ditches and culverts	24.00	21.67
Repairing end-walls and culverts	8.12	82.19
Repairing guard rails	00.00	7.59
Surfacing; gravel	23.19	534.91
Surface treatment; tar	1,154.11	1,494.89
Bridges	....	3.00
Total	$1,338.08	$2,263.22

We make this surface treatment 16 ft. wide, the same width as the gravel surface, and make the application from automobile trucks fitted with spray bars that will cover 8 ft. One-half of the road is treated at a time and we try to allow about three days before the other half is treated.

I have neglected to state that in the preparation of the surface each spring more or less new gravel is added by way of light patching to fill up depressions and bring back the crown of the road.

In Table I is given the cost of maintenance on the section which I have been describing, during a period of three years. The distribution of cost you will see is not carried out for the year 1917, simply due to the fact that while the data are in our files, they will not be assembled until during the winter.

Let us now consider a gravel surface carrying a lighter traffic, say 200 to 500 vehicles per day, during five or six months of the year, the maximum traffic amounting to 650 vehicles in a day. This road is taken care of by a patrolman who is equipped with one horse; a drop-axle wagon; a light drag, which one horse can draw; and with ordinary small tools. The length of the section is from 6 to 8 mi. Maintenance gravel which has passed through a 1⅜-in. screen is distributed along the section in piles at convenient points, say every 1,000 or 1,500 ft. Work begins on this section as soon as the snow has left the ground and the surface begins to soften up, which will be from the 1st to the 15th of April. The patrolman spends his time in dragging when conditions are right for dragging, raking off loose rocks and patching depressions with gravel. He also keeps the ditches and culverts clear, does any necessary repairing to end-walls and guard-rails, keeps weeds trimmed off the shoulders of the road and the sides of the road trimmed of small bushes and noxious weeds.

TABLE II.—MAINTENANCE COSTS ON STATE HIGHWAY "D," WALDOBORO.

Gravel Surface; 7.09 mi.

	1915.	1916.	1917.
Patrolman's wages	$546.98	$529.17	$627.69
Extra help	89.19	463.25	1,227.56
Material	00.00	51.42	180.94
	$636.17	$1,043.84	$2,036.19
Inspection	7.67	18.57	30.00
Total cost	$643.84	$1,062.41	$2,066.19
Cost per sq. yd	0.0096	0.016	0.03064

Distribution of Cost.

	1915.	1916.
Cutting bushes	....	$5.76
Dragging	$208.74	153.15
Raking rocks	180.77	75.11
Cleaning ditches and culverts	177.86	39.93
Surfacing; gravel	68.80	767.01
Bridges	....	2.88
	$636.17	$1,043.84

After about two years' wear we begin resurfacing with gravel, all of which has passed a 1⅜-in. screen. Ordinarily, the resurfacing consists of spreading gravel so that 1 cu. yd. will cover from 10 to 12 ft. in length and about 10 ft. in width. This gives an average depth of 3 in. and takes 480 cu. yd. to the mile. This resurfacing is usually done between Labor Day and the 15th of November. The traffic materially lessens after Labor Day and resurfacing operations interfere less then with the traffic.

We do not use any roller when putting on this new gravel surface, but depend on traffic and the care of the patrolman with his drag to get the gravel into shape while it is consolidating. Some of the gravel does not get compacted in good shape until after the frost has worked on it and it has been dragged a few times in the spring. It then bonds into the old surface, if it hasn't before, and we have substantially a new gravel road.

(*Continued on page 336*)

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Articles by road builders are solicited. They should be short and, if possible, accompanied by photographs. Those accepted will be paid for at current rates.

December 29, 1917

THE 1918 ROAD BUILDING PROGRAM AND PREPARATIONS FOR MOTOR TRUCK TRAFFIC

The necessity for preparedness has been brought home to the American people most effectively during the past few months. The lesson has been a hard one in many ways, for, as a nation, we were very unready and we have paid and are still paying dearly for our failure to look beyond our present needs.

Among the unpleasant facts revealed by the unexpected strain upon the country's resources, the inefficiency of the transportation system stands out as perhaps the most striking. The railroads, hampered from the outside by mischievous and unwise legislative interference, and—in some cases—handicapped from the inside by stock jobbing managements, have proven adequate for only a part of the work they have been called upon to do. Their partial failure has thrown an enormous burden upon the highways which, formerly regarded as merely feeders for the railroads, are now not only feeders but often the main arteries of commerce also.

Without discounting the work that has been done to improve the nation's roads during the past two decades, it can be said that the emergency has found the highways partly unprepared. So long as their function was held to be hauling to and from the railroads their improvement was carried on with that service as the governing factor in location, design and construction. It is only within a comparatively short time that through traffic other than touring has been a factor in the situation. For these reasons the building of through routes has had little attention except from the automobilists. Had the country remained at peace, this situation might not have changed for some time, for long distance motor truck hauling would have been developed only as that method became able to compete with railroads in price. But under present conditions, and those likely to obtain for some time to come, the problem is to move freight, cost being a secondary matter.

Road builders, then, are confronted by the problem of providing practicable routes for long distance motor transportation and doing their part to reduce the cost as much as possible.

The first step towards the solution is the planning of next season's work. And the time to do that part is here. In a large section of the country construction will be at a standstill for the next two or three months. In that time it should be possible to make a complete study of transportation needs, ascertain what is available in men, money and materials, lay out the work to be done and get ready to begin active work at the earliest possible moment. The existing authorities are quite competent and are clothed with the necessary authority to undertake this work. The state highway departments, the Office of Public Roads, and the Highways Transport Committee, cooperating with each other and calling upon existing organizations for such data as may be needed, can accomplish this work efficiently and expeditiously. The chief requisite is cooperation.

Having made the necessary preparations during the period in which construction is impossible, active work should be undertaken as soon as possible and prosecuted vigorously. The difficulties will be many, but not, we believe, insuperable. Those that have hindered work the most during the past season—scarcity of labor and transportation troubles—can be expected to be the most troublesome next year. The first will undoubtedly be the worst, but there are several practicable means of overcoming it. Two—prison labor and the labor of enemy aliens—have been suggested in these columns. It has also been suggested here that prisoners of war be used. This country must supply much of the food used on the other side and it is difficult to see why we cannot feed prisoners here more cheaply than we can send food to Europe for the same purpose. Moreover, as men, munitions and supplies are sent overseas, the returning transports and supply ships will be available for bringing prisoners to this country. The transportation difficulty can be largely solved by the proper coordination of priority orders and by the use of motor trucks for hauling materials and moving men and equipment.

While this work is being done, maintenance must not be neglected. The roads that are already improved must not be allowed to deteriorate because of neglect. They are assets that must be utilized to the fullest extent, as they can be only if kept in good conditions. And they represent an investment that will be lost if they are not kept up and that will yield large returns if they are properly cared for.

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Tulsa County, Okla., has voted a bond issue of $1,750,000, the proceeds of which will be expended in the construction of 100 mi. of permanent roads. It is reported that the roads will cost $17,500 per mi.

The Highways Transport Committee has been notified by the Pennsylvania State Highway Department that preparations are being made to keep the state's thoroughfares open during the winter to facilitate their use by trucks and truck trains operated to relieve the railroad congestion. The council, it is reported, has announced that other states along the main overland routes will be expected to follow Pennsylvania's example.

A Plea for Continued Road Building is contained in a "War-Time "Decalogue for the Motorist" recently given out by President C. H. Larson of the Motor Club, New York, N. Y. The ten commandments given by Mr. Larson are a series of "don'ts," one of which is as follows: "Don't oppose the expenditure of municipal, county, state or federal funds for the building of roads. They are a vital part of adequate military equipment and preparation."

Tests of the Influence of Grading on the Value of Fine Aggregates for Concrete Road Work

(Continued from page 331)

variation in strength shown, especially in compression. Thus, without considering either the very coarse or very fine sand, which would be used rarely in actual construction, the variations in strength are still large. Let it be assumed, for instance, that a specification calls for a sand which shall show from 20 to 30% retained on the No. 20 sieve. The results of these tests show a possible variation in compression of from 1,200 to 3,000 lb per sq. in. for sands fulfilling this requirement. They show also that much higher strength may be obtained in the mortar by the use of coarser sands up to as high as 70% retained on a 20-mesh sieve. It is realized, of course, that such coarse sands seldom are met with in practice, and, if they were, would not be used in ordinary work where a considerable amount of fine material is needed to produce workability. It must be borne in mind, however, that concrete pavement construction is not ordinary work on account of the severity and variety of the destructive forces encountered. It has been the custom to meet this condition by increasing the amount of cement to about 40% of the mortar in a 1:3 mix, and while this is good practice, it seems reasonable to suppose that a still greater resistance to these destructive agencies would be obtained by increasing the amount of the coarse sand which takes this wear (the ¼-in. to 20-mesh material) over that which is usually considered good practice. This would seem to be allowable, especially in view of the large excess of cement that is always used. When one considers that a large proportion of the wearing surface of a concrete pavement is composed of mortar, the danger of using a fine sand, with subsequent weakening of the matrix, is apparent.

In the foregoing discussion it is realized that but few naturally occurring concrete sands are as coarse as those making the strongest mortars, according to these tests. Neither has the fact been overlooked that the best mortar, when combined with stone or gravel, without reference to its grading, will not necessarily produce the best concrete. A poorly graded coarse aggregate will unquestionably require more mortar than will a well graded one. Likewise, a coarse aggregate containing a large amount of small stone will allow the use of a somewhat finer sand than when the larger-sized stones predominate. When it is considered, however, that the mortar in concrete forms a matrix by which the larger stones are held in place, that this matrix occupies nearly one-half the total volume of the concrete, and, finally, that its strength and toughness are undoubtedly influenced to a large degree by the grading of the sand, the discussion becomes of practical value. So important does it become that it might even be considered practical to use a graded rather than a naturally occurring concrete sand in such important work as concrete road construction if by so doing the life of the pavement can be prolonged.

The Maintenance of Gravel Roads

(Continued from page 334)

During the winter of 1916-17 we carried on quite extensive resurfacing operations, hauling the gravel on snow. We were able to secure men and teams at that season of the year more readily than in the summer. We also found that the teams would haul from 2 to 3 cu. yd. at a load, as against 1¼ to 1½ cu. yd. on wheels. Taken as a whole, this work was very satisfactory and we are planning to repeat the operation this winter.

The gravel is not spread as it is delivered on the road, but is piled in a windrow on one shoulder of the road. As soon as the snow has left the road in the spring the gravel is spread with a road machine. The cost for spreading we have found to be about 3 ct. per yd. and with an experienced operator we have been able to spread the gravel as well as it can be done by hand.

In Table II is given the cost of maintenance on the section which I have been describing, during a period of three years.

The distribution of cost for 1917 is omitted for the same reason given before.

We expect during the coming season to combine three or four patroled sections, furnish the men with a Ford 1-ton tractor, five of which we have purchased, and have a gang of from three to four men to look after from 18 to 25 mi. of road. We believe this will be more efficient and more economical than employing four men and four horses to care for a similar length of road.

Continued Activity in New Jersey Road Work Recommended by Gen. Goethals

In the face of all the opposition to the construction of roads during the present period of high prices, resulting from present uncertain conditions, New Jersey's $15,000,000 road building program should be begun early in the spring of 1918, according to Gen. Geo. W. Goethals, State Engineer of New Jersey. According to his report to the State Highway Commission, the state would not be warranted in delaying the work because of present high prices of materials.

Estimates prepared at this time, Gen. Goethals says, in substance, might be found insufficient. On the other hand a return to normal conditions, resulting from an over-supply of labor due to release from military obligations, would probably reduce an estimate made at this time. "This, however, is entirely problematical," he says, "and should not be seriously considered." The report continues:

"Modern highways are a military as well as a transportation asset, and whatever the cost, such improvements never were so greatly needed in this leading industrial and agricultural state, one of the main entrances to the country's outlet, the Port of New York. If the state should await the return of lower cost prices, there will result attendant loss of business, and consequently a higher ultimate cost, all things considered. Any difference in cost would not warrant such a curtailment of the enterprise, and so far as that viewpoint is concerned, in the opinion of many economic authorities, lower construction price conditions will never return."

The report points out that the elimination of all grade crossings, so far as may be possible, is required by the new road law, and that this involves a heavy expenditure.

"How many of these the railroads can be required to change is not known, but this is a question that merits careful consideration. Some of the grade crossings may be eliminated with the construction of the roads, while others may be safely left to a later period when more advantageous prices can be secured," Gen. Goethals continues. "These two questions, the bridges that should be rebuilt at once and the grade crossings that may be safely left until a later date, are matters which should be left to the discretion of the State Highway Commission, and legislation secured to this end."

Gen. Goethals further states in his report that, conforming to the provisions of the law, the new roads contemplated are to be 30 ft., with 18-ft. pavements, except in a few special cases, and with shoulders of penetration macadam, as a rule 3 ft. wide.

In regard to motor truck hauling, especially in New Jersey, the report is, in part, as follows:

"The congested condition of the railroads for some time past brought the motor truck to the fore as a means for transporting farm and manufactured products. The present and prospective war conditions affecting the handling of freight by the railroads will result in a greater use of motor trucks, as well as tend to increase the loads hauled by them. In the State of New Jersey, motor truck routes have already been established, and, in addition, manufacturing concerns are establishing their own service for handling their products. Consequently the necessity for good roads is now greater than ever, and, to handle such traffic, the roads must be provided with good foundations, with proper drainage, if the maintenance charge is to be reduced to a minimum."

Gen. Goethals' views as to the actual carrying out of the work of construction are as follows:

"The law authorizes work on the state highways to be done by the state as a contractor. Generally I prefer this method as promising the most satisfactory results, and this is especially true in the present condition of labor and the cost of materials. The organization of our engineering and construction department, which is successfully and at reduced cost over previous contract prices, building the new highway to Camp Dix in Burlington County, will to a considerable extent reduce costs which the state would have been compelled to accept in constructing the new highway system. This with the assistance of reformatory and convict labor, will, to some extent, offset the increased cost of present day construction."

New Jersey's proposed highway system will have a total length of nearly 650 mi. Five years was the period originally set for the completion of the work, but owing to the shortage of men, due to the call to military service, this time period will, it is thought, be somewhat lengthened. The cost of the system, originally expected to reach $15,000,000, will be defrayed through the direct tax plan by the imposition of a 1-mill tax upon every dollar's worth of real and personal property in the state. It has been estimated that the first year's revenue will approximate $3,165,000 and will be available for the State Highway Commission in January, 1918. Motor vehicle receipts and the legislative appropriation for the coming year will be utilized for the construction of new county roads and maintenance of others through state aid to the counties.

Revision of Virginia Road Laws Recommended by State Highway Commissioner

Changes in the road laws of Virginia are recommended in the annual report of State Highway Commissioner Geo. P. Coleman, recently submitted to Governor Stuart.

Commissioner Coleman recommends a system providing for the joint prosecution of work on the important highways by the state and the county, using state and federal funds and convict labor, and also recommends that the road work of less importance be left entirely to the county authorities. Increasing the state appropriations to $500,000 was also recommended.

Suggestions for 1918 Road Work

A circular letter has been recently sent out by Logan Waller Page, Director of the Office of Public Roads and Rural Engineering, to the various State Highway Commissioners, calling attention to the present situation in the road building field and recommending certain policies for next year's work.

The situation, according to Mr. Page, "would be serious even in normal times, but in this crisis when the public roads must, in addition to normal traffic, be depended upon to relieve the tremendous strain to which the railways are subjected, it becomes a matter of vital importance that some means be found at least to deal with next season's work so as to assure better results than are possible under our present system."

Mr. Page's suggestions for remedying some of the weaknesses of the present system are as follows:

"(1) The selective consideration of all of next year's construction jobs in all of the states and the preparation of a program of road work throughout the nation, in which program each construction job be listed in the order of its economic importance to the particular territory in which it is located and to the nation as a whole. This arrangement would permit of the elimination of such work as may be omitted with least injury to our economic welfare.

"(2) A coordination of this selective process with the railway and water transportation facilities with a view to insuring an adequate number of cars and vessels of suitable types, with proper distribution to transport materials for the construction of the approved jobs.

"(3) A coordination with the materials industries with a view to insuring supplies of materials in adequate amount, distribution, and deliveries to permit the construction program to be carried out.

"(4) The adoption by each state of such measures with reference to construction contracts as would best meet the needs and requirements of the state."

Short Course in Highway Engineering at the University of Tennessee

A short course in Highway Engineering is to be held at the University of Tennessee from Jan. 7 to Feb. 15.

The course is to be given by the University in cooperation with the State Highway Department. The faculty of the course will consist of Chas. E. Ferris, Dean of Engineering; N. W. Dougherty, Professor of Civil Engineering, and Erwin Harsch, Instructor in Civil Engineering, University of Tennessee; A. M. Nelson, State Highway Engineer, and J. A. Reagan and R. C. Fergus, Division Engineers, Tennessee Highway Department.

State and Federal Aid Extended to Texas Counties

At the November meeting of the Texas State Highway Department, state and federal funds were granted to a number of the counties of the state. In the following paragraphs the amounts given are those which are not to be exceeded.

Federal Funds.—Anderson, $50,000; Bell, $50,000; Bexar, $55,000; Calhoun, $10,000; Cass, $50,000; Cherokee, $30,000; Coke, $20,000; Colorado, $44,000; Comal, $17,500; Donley, $16,000; Eastland, $46,000; Fayette, $50,907; Foard, $20,000; Fort Bend, $50,000; Franklin, $25,000; Gaudalupe, $34,900; Gillespie, $20,000; Gonzales, $48,000; Harris, $475,000; Hemphill, $17,000; Henderson, $30,000; Houston, $30,000; Jasper, $30,000; Jefferson, $40,000; Kendall, $21,000; Lamar, $19,000; Liberty, $20,000; McCulloch, $35,000; Mason, $11,266.75; Morris, $49,600; Nolen, $29,500; Randall, $11,880; Robertson, $25,000; Sabine, $18,000; Smith, $16,000; Titus, $47.700; Val Verde, $10,000; Wharton, $11,763.35; Wheeler, $35,000; Wise, $80,000.

State Funds.—Cherokee, $5,000; Coke, $5,600; Colorado, $11,000; Cooke, $4,000; Fayette, $14,134; Fort Bend, $12,500; Gaudalupe, $10,785; Hardeman, $2,025; Jasper, $10,000; Liberty, $5,000; McCulloch, $15,000; Oldham, $1,863; Orange, $9,750; Randall, $4,317.50; Sabine, $7,500; Wharton, $13,838.

State aid was granted Galveston and Kendall Counties to the limit authorized by law.

State and federal aid was granted to Childress County to the amount of $35,000.

Road Funds in Nassau County, New York

Approximately $425 000 will be available for the maintenance and improvement of roads in Nassau County, New York, during 1918, according to the estimate of the County Superintendent of Roads. This estimate, made in accordance with the mileage of roads in each of the three townships, is as follows:

	Maintenance.	Improvement.
Hempstead	$57 150	$95,250
North Hempstead	36,900	61,500
Oyster Bay	55,950	93,250

Besides these amounts there will alloted to the three townships certain amounts from the county tax on mortgages. Of these funds, Hempstead will receive $9.517.57, North Hempstead $4.378.13, and Oyster Bay $7.707 89. The balance of the total fund, which amounts to $24 803.21, will be apportioned to the incorporated villages in the county on the basis of their assessed valuations.

Bond Elections in Texas Counties

An election on the question of issuing road bonds to the amount of $250,000 will be held in El Paso County, Texas on Jan. 4. A $100,000 issue will be voted on in Road District No. 1 of Fayette County on Jan. 15.

Recent bond issues have been voted in Texas Counties as follows: Eastland, Road District No. 2, $50,000; Scurry, $100,000; Sabine, $500,000; Wharton, Road District No. 3, $[illegible]; Colorado, Eagle Lake District, $75,000; Gonzales $75,000.

Road Funds for 1918 in Suffolk County, New York

A total of nearly $[illegible] will be available for road work in Suffolk County, New York, in 1918, according to a recent statement. This amount is said to be the largest that the ten towns in the county have ever had available for this purpose in any one year. It is also possible, it is said, that work by the state in the county may bring the total to nearly double this amount.

The totals available for the ten towns of the county are as follows:

Southampton	$119,891.03
Huntington	127,205.84
Babylon	20,167.79
Brookhaven	123,299.37
Easthampton	40,018.71
Smithtown	28,883.13
Riverhead	38,204.71
Islip	97,174.40
Shelter Island	8,757.46
Southold	53,866.26

Favorable Report on the New York-New Jersey Tunnel

A favorable report on the proposed construction of a tunnel under the Hudson River, between New York and New Jersey, has recently been made by Gen. Goethals, State Engineer of New Jersey.

The report is to the effect that a tunnel between Canal St., Manhattan, and 12th St., Jersey City, is feasible; that the shield method of construction is preferable to the trench method, and that the cost should not exceed $12,000,000. A single tunnel instead of a pair of tubes is recommended. The plans under consideration call for a double deck tube; slow, heavy vehicles to be carried on the lower deck and the ligher, faster vehicles on the upper.

The construction of a tunnel of this sort has been under consideration for over ten years. The matter is now in the hands of a commission from New Jersey, cooperating with one from New York.

North Dakota Highway Bulletin

The first number of a publication, entitled "North Dakota Highway Bulletin," has recently been issued by the State Highway Commission of that state. The bulletin is intended especially for "county commissioners and other county and town officials actively engaged and interested in highway improvement and for commercial clubs, auto clubs, women's clubs, farmers' association, dealers' organizations, libraries and individuals known or supposed to be interested in this public work," according to the preliminary announcement.

The first number of the bulletin is 9x12 in. in size and consists of sixteen pages, including covers. Among the articles in the first issue are: "North Dakota's Interest in Good Roads," by Governor Lynn J. Frazier; "Review of Present Road Law," by State Engineer J. W. Bliss; "Better Roads in North Dakota," by J. E. Kaulfuss, Highway Engineer of the Commission; and "The Commission's Work in 1917," by P. W. Thomas, Bridge Engineer of the Commission. There are also included several short articles, biographical sketches of the members of the commission and the text of the federal aid road law. The front cover carries an illustration, showing an earth road in Oliver County, and the back cover carries a map of the state, showing the tentative highway system.

Recent Toll Road Purchases in Pennsylvania

The purchase of a section of the Old York Road, extending from the Philadelphia city line to a point about 1 mi. north of Hatboro, Bucks County, has been made by the State Highway Department from the Cheltenham & Willow Grove Turnpike Company and the Hatboro & Warminster Turnpike Road Company. The purchase price of $105,000 includes the various toll-house properties along the road.

The portion of the road from the Philadelphia city line to Willow Grove was controlled by the Cheltenham & Willow Grove Turnpike Company, and was purchased for $80,000. The remainder of the road, extending from Willow Grove to Street Road, was controlled by the Hatboro & Warminster Turnpike Road Company, and was bought for $25,000.

The Old York Road was built before the Revolutionary War, and is said to have been traveled by the armies of General Washington before and after the battles of Germantown and Trenton. It is said that the first artificial road surface ever built in America was put down on this highway. It consisted of logs and planks, and in 1894, when trolley tracks were laid, some of the old timbers were uncovered.

State and Federal Aid Available for Earth Roads in Missouri

The Missouri State Highway Department has advised local road authorities that state and federal aid can be had to pay one-half of the cost of grading and otherwise improving earth roads.

"In North Missouri," the letter from the state department declares, "the opinion seems to be general that the state and federal money will only be available to pay for the construction of brick, concrete, bitulithic or some other type of high-class paving. This is not correct. In this connection the United States Office of Public Roads issued the following instructions: 'States may submit for approval any kind of road, even an earth road, and approval will be given if the construction be substantial in character, suitable for traffic needs, and meets the terms of the federal act.' This matter was discussed at length at the recent convention of state highway officials held at Richmond, Virginia, where it developed that more than 90% of the roads to be improved during the next year or two will be of earth construction. The high cost of materials, the inability of railroads to furnish cars when needed, and the scarcity of labor are important factors, while there is another advantage in having a subgrade settle well before the surfacing material is applied. The State Highway Department, in cooperating with counties in the construction of properly graded earth roads, will, of course, proceed on the theory that the roads are to be hard-surfaced as soon as conditions will permit, and will require a pledge of this character from county, township or district officials."

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Road work in Mobile County, Alabama, may be delayed for an indefinite period, because of the high price of gravel. At the same time, according to President Ward of the County Board of Road Commissioners, the work of preparing the roads for the gravel surfacing is being continued in the hope that conditions will improve. There are many miles of road in the county that are affected by this condition, the principal one being the road from Satsuma to the county line, a distance of 25 mi.

MEETINGS

Calendar of Coming Meetings

Jan. 12, 1918.—Northwestern Society of Highway Engineers.—Annual meeting, Benson Hotel, Portland, Ore. Secretary, C. G. Reiter, Hillsboro, Ore.

Jan. 15-17, 1918.—Virginia Good Roads Association.—Seventh annual convention, Richmond, Va. Secretary, C. B. Scott, Richmond, Va.

Jan. 22-24, 1918.—American Wood Preservers' Association—Annual meeting, Chicago, Ill. Secretary F. J. Angier, Baltimore & Ohio Railroad, Mount Royal Station, Baltimore, Md.

Feb. 4-7, 1918.—American Road Builders' Association.—Fifteenth Annual Convention and Eighth American Good Roads Congress under the auspices of the A. R. B. A., Hotel Statler, St. Louis, Mo. Secretary, E. L. Powers, 150 Nassau St., New York, N. Y.

Feb. 7-9, 1918.—American Concrete Institute.—Annual convention, La Salle Hotel, Chicago, Ill. Secretary H. B. Alvord, 27 School St., Boston, Mass.

Feb. 8-9, 1918.—American Concrete Pipe Association.—Annual convention. Sherman Hotel, Chicago, Ill. Secretary, J. H. Libberton, 208 S. La Salle St., Chicago, Ill.

April 15-17, 1918.—United States Good Roads Association.—Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

April 18-19, 1918.—Bankhead National Highway Association.—Annual meeting, Little Rock, Ark. Secretary, J. A. Rountree, 1021 Brown-Marx Building, Birmingham, Ala.

Albert Pike Highway Association

The annual meeting of the Albert Pike Highway Association will be held at Fort Smith, Ark., on January 11. The organization has for its object the construction of a highway from Colorado Springs, Colo., to Hot Springs, Ark. Cyrus S. Avery, of Tulsa, Okla., is the president of the association.

Organization of County Judges in Missouri

The annual meeting of the organization of County Judges in Missouri was held at Jefferson City on Dec. 11 and 12.

Addresses were made by representatives of the State Highway Board and the State Tax Commission. At a reception held at the executive mansion following the conclusion of the business session, A. C. McKibbin, Secretary of the State Highway Board, was one of the speakers.

Officers were elected for the coming year as follows: President, Alexander Carter, Audrain County; Vice Presidents: John A. Fischer, Cooper County; F. L. Lloyd, Lewis County: Chas. C. Redman, Dunklin County: A. W. Baker, Barton County: J. F. Kircher, Cass County; Secretary-Treasurer, C. P. Schmidt, Nodaway County. Mexico, Audrain County, was chosen as the next place of meeting.

The semi-annual meeting of the Central Florida Highway Association was held at Haines City on December 11. An automobile ride over the Polk County roads in the neighborhood of Haines City was one of the features of the meeting.

A meeting of county supervisors, county engineers and consuls of the Lincoln Highway Association, from counties through which that highway runs, was held at Marshalltown, Ia., on December 11. The purpose of the meeting was to discuss the maintenance and improvement of the road, with special reference to its use for war purposes.

The annual meeting of the Linn County Good Roads Association was held at Albany, Ore., on December 15. Officers were reelected as follows: President, R. W. Davis, Harrisburg; 1st Vice President, M. A. Allen, Jefferson; 2nd Vice President, A. W. Cormack, Albany; Corresponding Secretary, John R. Penland, Albany; Secretary and Treasurer, A. C. Schmitt, Albany.

PERSONAL NOTES

Howard Chesnut has been made City Engineer of Bloomington, Ind.

John S. Bates has been appointed City Engineer of Selma, Cal, succeeding Wm. W. Shafer.

George T. McCoy has been appointed Office Engineer of the North Dakota Highway Commission.

C. P. Hoff, formerly City Engineer of St. Joseph, Missouri, is now employed by the Grand Island Railroad.

F. G. Whaley, formerly City Engineer of Chehalis, Washington, has taken a position as Valuation Engineer for the State of Washington.

Calvin E. Cook has been appointed consulting engineer for the work under a $400,000 bond issue recently voted in Dickens County, Texas.

Hale Judson has been appointed City Engineer of St. Joseph, Mo., succeeding C. P. Hoff, whose resignation is noted elsewhere in this column.

Richard A. Wachter, formerly First Assistant City Engineer of St. Joseph, Mo., has left the city service, the position he occupied having been abolished.

J. J. Gaillard, formerly City Engineer of Macon, Ga., is now a division engineer with the Portland Cement Association. Mr. Gaillard's headquarters are at Macon.

J. L. Stackhouse, Assistant Secretary and Auditor of the Amies Road Company of Easton, Pa., has resigned to become Business Manager of the Easton "Express."

James Allen has been reappointed State Highway Commissioner by Governor Lister of Washington. Mr. Allen has served one term, having been first appointed in 1913.

W. W. Burden, formerly an engineer with the Department of Street and Sewers of St. Joseph, Mo., has been given a captain's commission and is Regimental Adjutant of the 12th Engineers.

Maury Nicholson has resigned as Assistant City Engineer of Birmingham, Ala., to accept a position with the Chickasaw Shipbuilding Co., of Mobile, Ala. Mr. Nicholson has been connected with the engineering department of Birmingham for about 17 years.

H. W. Heilmann, who has been serving as county engineer of Essex County, New Jersey, since County Engineer F. A. Reimer entered the service, has been appointed Acting County Engineer and has been given an increase in salary of $500 a year. Mr. Heilmann was formerly Assistant County Engineer.

H. R. Campbell, Statistician of the Pennsylvania State Highway Department, has resigned, effective Jan 1. Mr. Campbell, whose resignation is due to ill health, was appointed Statistician of the department in April, 1917, by former Highway Commissioner Black, to fill the vacancy caused by the resignation of W. R. D. Hall. For a number of years Mr. Campbell was connected with the County Commissioner's office at Washington, Penn.

PUBLICATIONS

"HIGHWAY WORK IN NORTH CAROLINA," during the calendar year ending Dec 31, 1914, a statistical report; compiled by Dr. Joseph Hyde Pratt, State Geologist, and Miss H. M. Berry, Secretary, Economic Paper No 44, North Carolina Geological and Economic Survey; Paper, 6¾x9¾ in.; 64 pages, and covers.

Except for a brief introductory statement setting forth the salient facts relative to road work in North Carolina and noting the sources of information utilized in its preparation, this report consists of statistical tables with explanatory notes. The six tables presented give the following data: I—Revenue by Counties and Townships from Direct Taxation (Property and Poll), Special Taxes (Auto Tax, Dog Tax, Central Highway Tax), Labor Tax, and Private Subscription; II—County and Township Expenditures for Roads by Bond Issues; III—Classified Road Mileage; IV—Use of Convict Labor in Road Construction during 1914; V—What Was Spent on Roads in 1914 and How It Was Spent; VI—Statement by Counties and Townships as to Administrative Boards and Systems of Maintenance.

"STANDARD FORMS FOR SPECIFICATIONS, TESTS, REPORTS, AND METHODS OF SAMPLING FOR ROAD MATERIALS," as recommended by the First Conference of State Highway Testing Engineers and Chemists, at Washington, D. C., Feb. 12-17, 1917; U. S. Department of Agriculture, Bulletin No. 555; contribution from the Office of Public Roads and Rural Engineering; Paper, 6x9 in.; 56 pages, and covers.

Among the standard forms included in this bulletin are the following: Specifications for materials, including broken stone, gravel and sand for various purposes; stone blocks; broken and granulated slag; road oils; asphalt cements; tars; Portland cement; steel reinforcement. The recommended standard testing methods include those for the physical properties of stone, slag, gravel and sand, and for the physical and chemical properties of bituminous materials. There are also recommendations for standard methods of testing Portland cement, reinforcing rods, and paving bricks. A considerable portion of the publication is occupied by forms for reporting tests. Sampling methods are recommended for broken stone and slag, stone blocks, gravel, sand, semi-gravel, top soil, sand-clay, bituminous materials, Portland cement, concrete, and vitrified paving bricks.

EQUIPMENT—TRADE—MATERIALS

Road Machinery Manufacturers Organize

An organization of Road Machinery Manufacturers, to be known as the Association of Manufacturers of Road Machinery, was formed at a meeting held at the La Salle Hotel, Chicago, Ill., on Dec. 11. The membership is to be made up entirely of manufacturers of road machinery.

W. T. Beatty, of the Austin Mfg. Co., Chicago, Ill., was elected President, David Cooke of the Acme Road Machinery Co., Frankfort, N. Y., was elected Vice President, and M. O. Baker of the Baker Mfg. Co., Springfield, Ill., was elected Secretary and Treasurer. Directors were elected as follows: S. Jones Phillips, of the Good Roads Machinery Co., Kennett Square, Pa.; Ray Adams, of J. D. Adams & Co., Indianapolis, Ind.; C. O. Wold, of the Russel Grader & Manufacturing Co., Minneapolis, Minn., and E. B. Smith, of Smith, Sons & Co., Kansas City, Mo.

Texaco, produced by the Texas Company, has been specified for surface treating 10 mi. of roads in Camp Logan, Texas. A contract for the work was awarded to Horton & Horton of Houston at a price of 25 ct. per sq. yd.

The carrying of capacity loads in motor trucks is urged by the Packard Motor Car Company. According to R. E. Chamberlain, truck sales manager of the company, truck owners carry capacity loads to a greater extent than formerly, but there is still room for improvement. Mr. Chamberlain estimates that there are 370,000 motor trucks in use in the country and that the loads carried average only about 45% of capacity. He states that if the average load can be increased to 70% capacity there will be an average daily saving of 48 ct. for every truck, which will amount to a yearly saving of over $53,000,000. "Any effort that owners may put forth to operate their trucks with full rated loads instead of part loads is not only a source of additional profit to themselves," according to Mr. Chamberlain, "but is a real help in our national program of efficiency in every line of activity."

The Blaw-Knox Company of Pittsburgh, Pa., has recently issued a small folder descriptive of the Blaw "Speedster" bucket. The folder is printed in two colors and is devoted to an illustrated description of the "Speedster" bucket for handling gravel, sand and similar material. A table of dimensions and capacities of the various sizes of buckets is included in the descriptive matter.

The Ransome Concrete Machinery Company of New York, N. Y., has recently issued a small booklet, entitled "War Income Tax and How It Affects You." The booklet is 2¾x5½ in. in size and consists of eight pages, including covers, in which are described briefly the provisions of the income tax. It is especially designed for the information of those having incomes of less than $5,000 a year.

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A Total of $79,634.77 for Highway Work in Madison County, New York, will be raised by taxation during the coming year.

Teague and Wortham Districts of Freestone County, Texas, will vote on the issuance of bonds, Dec. 31. The proposed issue in Teague District amounts to $150,000, and that in Wortham District to $75,000.

Macoupin County, Ill., has approved a bond issue of $160,000 for road improvement. It is expected, according to report, that this money will be used in the improvement of main highways.

The Maryland State Roads Commission has prepared a bill asking the General Assembly of the state for an appropriation of $500,000 for the construction of unfinished gaps in the state highways through incorporated towns and cities.

Brick Pavements are Being Laid at Camp Johnston, Fla., by the Wilson Construction Co. of Jacksonville. It is expected that by the first of the year about 6 mi. of roads will have been built at the cantonment. The contractor, it is stated, is employing a force of over 300 men.

The Survey of the Coast Link of the Central Oregon Highway was recently completed by Assistant State Highway Engineer C. M. Thomas. An excellent route with a maximum grade of 5% has been selected with only two places at which it was found necessary to use the 5% grade.

Only State Aid Roads in Adams County, Ill., will be improved with county funds, according to a recent decision by the county supervisors. This new ruling, however, it is reported, can not become effective until Sept., 1918, when the Legislature will make the next appropriations.

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Good Roads...
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